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Final Environmental Impact Statement
DOI-BLM-ID-B000-2014-0002-EIS

Boise District Office
Bruneau-Owyhee Sage-grouse Habitat Project (BOSH)

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U.S. Department of the Interior
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Boise District Office
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Environmental Impact Statement # DOI-BLM-ID-B000-2014-0002-EIS
(Bruneau-Owyhee Sage-grouse Habitat Project)

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1.0 Introduction

For years researchers have identified sagebrush steppe ecosystems, including the wildlife species that depend on them, as the most at-risk in North America due to habitat loss and fragmentation (Knick et al. 2003; Dobkin and Sauder 2004; Davies et al. 2011; Miller et al. 2011). There are many causes for the loss and/or degradation of sagebrush steppe habitat: anthropogenic development (agriculture, mining, energy development, and urban development), improper livestock grazing management, wildfire, invasive annual grasses, and conifer encroachment (USDI FWS 2013a; USDI BLM and USDA FS 2015a). In southwest Idaho, western juniper (conifer) encroachment has been identified as a major threat to sagebrush ecosystems and, in turn, to sage-grouse which depend upon sagebrush to survive (ISAC 2006, Section 4.3.10; FIAT 2014; OLWG 2000).

As junipers encroach into sagebrush habitat, sagebrush steppe vegetation eventually dies off because it is unable to compete with junipers for water, nutrients, space, and sunlight (Bates et al. 2000; Mollnau et al. 2014). The loss of sagebrush steppe vegetation from juniper encroachment and the resulting threat to sage-grouse and other species that depend on sagebrush ecosystems is widely documented (Miller et al. 2000; USDI FWS 2010a; Miller et al. 2011; Baruch-Mordo et al. 2013; Farzan et al. 2015; Coates et al. 2017; Miller et al. 2017; Prochazka et al 2017; Severson et al. 2017a). Reinhardt et al. (2017) state that sage-grouse respond directly to conifer expansion through decreased breeding activity, nesting, and overall survival; thus, small amounts of conifer expansion can have significant impacts on sage-grouse habitat and populations.

In its 2010 Findings for Petitions to List the Greater Sage-Grouse, the US Fish and Wildlife Service (FWS) reports that juniper encroachment contributed to habitat fragmentation, particularly in the Great Basin, and that regardless of the cause of conifer woodland encroachment, the rate of expansion is increasing, resulting in the loss and fragmentation of sagebrush habitats (USDI FWS 2010a). Likewise, the 2015 Findings for Petitions to List the Greater Sage-Grouse also identifies juniper expansion as a threat to sage-grouse because it alters habitat composition. Miller et al. (2008) estimated that without intervention, 75% of the western portion of the sage-grouse range may transition into juniper woodlands within the next 30-50 years.

The 2013 FWS Conservation Objectives Team (COT) report states that “greater sage-grouse are negatively impacted by expansion of pinyon and/or juniper in their habitats, even if the underlying sagebrush habitats remain. Sage-grouse avoid these areas of juniper expansion, and as pinyon and/or juniper increases in abundance and size, the underlying habitat quality for sage-grouse diminishes.” The COT report identified conifer encroachment as one of the primary threats to sage-grouse in the Northern Great Basin Population, which includes southwest Idaho (USDI FWS 2013a). Juniper treatment is necessary to reduce this primary threat to the sagebrush ecosystem and the species that rely on it.

In the recent past, juniper treatments have typically been local and reactive rather than regional and strategic (Wisdom and Chambers 2009). Many acres of juniper have been treated since 2004, but treatments are not keeping pace with the current rate of juniper encroachment in southwestern Idaho (Wisdom and Chambers 2009; USDI FWS 2010a). In order to make effective, measurable and long-term changes beneficial to sage-grouse, juniper treatments must be completed at the landscape scale and target early-stage encroachment (Wisdom and Chambers 2009; Baruch-Mordo et al. 2013; Bates et al. 2017; Coates et al. 2017; Gibson et al. 2016; Miller et al. 2017; Prochazka et al. 2017; Severson et al. 2017a and 2017c). Past treatments have tended to focus on areas of late stage encroachment that may not benefit sage-grouse for many years. Targeting early stage encroachment provides immediate benefits by improving nesting and brood rearing habitat, and providing connectivity between habitat types.

Impacts to sage-grouse populations from the presence of juniper are occurring before major shifts in vegetation composition are observed. Baruch-Mordo et al. (2013) found that even a low level presence of juniper in sagebrush steppe habitat can cause population-level impacts to sage-grouse; no leks remained active when conifer (e.g., juniper) canopy exceeded 4% cover within 1 kilometer (0.62 mile) of a lek. A more recent study by Coates et al. (2017) indicated that juniper canopy cover as low as 2% can lead to avoidance, and reduced survival of sage-grouse and that juniper stands can negatively impact sage-grouse distributions and demographics. In the winter, sage-grouse avoided areas within 805 meters (0.5 mile) of conifer habitats (Doherty et al. 2008). The reasons for sage-grouse avoidance of juniper are currently unclear; however, the prevailing thought is that it may be related to the presence of predators (birds of prey use juniper trees as perches) and habitat fragmentation of the sagebrush steppe. Not only does juniper encroachment cause a loss of habitat for sage-grouse, it can also directly affect survival of individual sage-grouse and their populations, overall.

Treating juniper in the early stages of encroachment, while there is still a viable and diverse understory of sagebrush and herbaceous native plant species, increases the likelihood of maintaining a resistant and resilient sagebrush steppe ecosystem. The 2010 finding by the FWS recognized the potential value of conifer removal treatments, particularly when done in the early stages of encroachment when sagebrush and forb understory is still intact (USDI FWS 2010a). If juniper treatment is not completed during the early stages of woodland development, the sagebrush steppe plant community runs the risk of crossing a threshold from which the sagebrush community may not be able to recover (Miller et al. 2000; Bates et al. 2013; Miller et al. 2013). Also, juniper treatments are more likely to be successful and less costly at the stages of early encroachment (Taylor et al. 2013). Studies of large-scale, early stage juniper control in eastern Oregon and southwestern Idaho have shown relatively rapid vegetation recovery (i.e., two to three years after juniper cutting) (Burkhardt and Tisdale 1969; Bates et al. 2000; Miller et al. 2000; Bates et al. 2005; Bates et al. 2017). Researchers have found there is usually a two-fold to seven-fold increase in herbaceous cover following juniper treatments, although this varied by site condition and level of juniper encroachment, with areas of late stage encroachment showing the poorest response to treatment (Miller 2005; Bates et al. 2013; Bates et al. 2017). There are also several recent studies indicating that removal of juniper encroaching into sagebrush steppe habitat at the early stages is important to maintain sage-grouse populations and suitable habitat (Bates et al. 2011; Pyke 2011; Baruch-Mordo et al. 2013; Bates et al. 2013; Miller et al. 2013;

Miller et al. 2014a; Bates et al. 2017; Coates et al. 2017; Gibson et al. 2016; Miller et al. 2017; Prochazka et al. 2017; Severson et al. 2017a and 2017c).

In response to the threat of sagebrush steppe habitat loss posed by the encroachment of western juniper, the Boise District BLM, in collaboration with the Idaho Department of Fish and Game (IDFG), the USDA Natural Resources Conservation Service (NRCS), FWS, Idaho Department of Lands (IDL), and Idaho Governor's Office of Species of Conservation, proposes to treat up to 726,000 acres of early stage juniper encroachment in southwestern Idaho. The BLM and its collaborators are proposing this project to maintain and improve sagebrush steppe habitat for the benefit of sage-grouse and other wildlife that rely on these habitats.

Early stage encroachment is defined as areas having up to 20% canopy cover of western juniper (See Section 2.2.2 for explanation of early stage juniper encroachment). Juniper treatments would be completed using one or more of the following methods which are described in further detail in Section 2.2.4:

- cut and leave,
- cut and remove (via jackpot and/or pile burning),
- and/or mastication, shearing or grinding.

1.1 Need for and Purpose of Action

Western juniper is in the early stage of encroachment across hundreds-of-thousands of acres across southwest Idaho within the Bruneau Owyhee Sage-Grouse Habitat (BOSH) project area, degrading sage-grouse habitat. Juniper encroachment has been identified as a major threat to sagebrush ecosystems and, consequently, to sage-grouse and its habitat in southwest Idaho which includes the BOSH project area. The purpose of the project is to improve and maintain suitable sage-grouse habitat within the Bruneau and Owyhee field office boundaries in southwest Idaho by removing early stage encroaching western juniper on BLM-managed lands.

1.2 Location and Setting

The project area includes 1.67 million acres within the Boise District BLM. The majority of those acres (1,089,970) are within the Owyhee Field Office and the remaining acres (574,767) are within the Bruneau Field Office (Map 1). The project area is situated south of Boise, Idaho within the following boundaries:

- South of State Highway 78,
- East of State Highway 95 and the Oregon border,
- West of State Highway 51, and
- North of the Nevada border.

Elevations in the project area range from 762 meters (2,500 feet) to 1,829 meters (6,000 feet). The project area lies within two Level III Ecoregions as described by McGrath (2002): the Northern Basin and Range and the Snake River Plain. Of the area identified for treatment, approximately 96% is within the Northern Basin and Range and the remaining 4% is in the Snake River Plain. The Northern Basin and Range Ecoregion consists of dissected lava plains, rolling hills, alluvial fans, valleys, and scattered mountains and is higher and cooler than the Snake River Plain.

The Northern Basin and Range Ecoregion supports sagebrush-grassland or saltbush-greasewood vegetation and cool season grasses (e.g., Sandberg bluegrass and bottlebrush squirreltail). Ranges are typified by sagebrush steppe covered in mountain sagebrush, mountain brush (e.g., bitterbrush, snowberry, and serviceberry), Idaho fescue, Douglas-fir, or aspen; low sagebrush and bluebunch wheatgrass are also common. Juniper woodlands normally occur on rugged, and more fire-safe stony uplands within this Ecoregion, but have expanded well beyond these sites and into the surrounding sagebrush steppe communities. The Snake River Plain Ecoregion consists of plains and low hills in the xeric Intermountain West. Potential natural vegetation is mostly sagebrush steppe, but barren lava fields and saltbush-greasewood communities also occur. There are many streams and rivers that flow through the project area and several have cut deep, narrow canyons that are often bordered by cliffs for many miles.

Sage-grouse Habitat in the Project Area

The BOSH project area falls within the greater sage-grouse Northern Great Basin population within Management Zone IV (USDI FWS 2013a) which straddles portions of Idaho, Nevada, and Oregon. Idaho's portion of the Northern Great Basin population and sage-grouse habitat, i.e., the West Owyhee Conservation Area which includes the BOSH project area, is monitored for adaptive management strategies. Within the West Owyhee Conservation Area, sage-grouse habitat is classified in accordance with the Idaho and Southwestern Montana Greater Sage-Grouse Resource Plan Amendment (ARMPA; USDI BLM and USDA FS 2015). This three-tier habitat classification system is based on sage-grouse conservation values from greatest to lowest: Priority Habitat Management Areas (PHMA), Important Habitat Management Areas (IHMA), and General Habitat Management Areas (GHMA). Acres of each habitat type are presented in Table 1. These habitat designations are designed to direct management to maintain and improve habitat conditions for long-term persistence of sage-grouse (see section 3.5.1 Affected Environment—Greater Sage-grouse). Restrictions for management decisions are highest in PHMA and decrease with conservation value of habitat types.

Table 1 – Acres of sage-grouse habitat by type for the project area[1]

Sage-grouse habitat type	Acres	Acres burned by 2015 Soda Fire
PHMA	909,000	37,000
IHMA	469,000	145,000
GHMA	203,000	0

[1]The project area denotes the 1.67 million-acre project area (Alternative C1 – Preferred Alternative); habitat management areas for focal treatment areas are presented for each alternative below in section 2.3 (Comparison of Action Alternatives). A total of 82,000 acres within the project area are not mapped as one of the sage-grouse habitat types under ARMPA.

Each year sage-grouse habitat and populations are evaluated and compared to 2011 baseline conditions in order to determine whether any management changes are needed to improve sage-grouse numbers or habitat (USDI BLM and USDA FS 2015). Thresholds for population and habitat declines are set for 10% and 20% ('soft trigger' and 'hard trigger', respectively) within PHMA or IHMA of a Conservation Area, also called a Biologically Significant Unit (BSU). After the 2015 Soda Fire, a 'hard habitat trigger' was tripped when 21% of areas with >10% sagebrush cover burned within IHMA of the West Owyhee Conservation Area and 31% of the project area (Table 1). As a result, BLM currently manages IHMA in the West Owyhee

Conservation Area as PHMA with its associated management restrictions until habitat returns to 2011 baseline conditions (USDI BLM and USDA FS 2015).

1.3 Scoping and Development of Issues

Internal meetings and meetings with cooperating agencies and other collaborators to discuss and develop the project proposal began in 2013. In January 2014, the Boise District BLM issued a scoping package to solicit public comments regarding this proposal and potential issues and effects to the environment. Due to the landscape scale of the project, the BLM decided an Environmental Impact Statement (EIS) was warranted. The BLM published a Notice of Intent (NOI) to complete an EIS in the Federal Register on January 20, 2015. The BLM hosted public meetings in Boise and Murphy, Idaho on February 4 and 5, 2015, respectively.

Based on internal and external scoping, BLM has analyzed the following issues raised during scoping:

- How will the project influence habitat use by sage-grouse and what will be the population response to treatment?
- How will juniper removal benefit or negatively impact migratory birds?
- What are the effects to native plant communities as a result of removing early stage encroaching juniper?
- How will the project affect sediment input into waterways?
- How will the proposed project impact stream shading?
- How will the proposed action affect soils and biological crusts?
- How will the proposed action affect visual resources?
- How will the proposed action affect the spread of noxious weeds and invasive annual grasses?
- What are the effects to recreational experiences and other social values in the area?
- How will the proposed action affect wilderness values?
- What are the effects to cultural resources as a result of the proposed action?

Other questions raised during scoping that BLM did not carry forward for analysis:

- What effects to wild horses and herd management areas (HMAs) might be expected?
    - Effects to wild horses and HMAs were not carried forward for further analysis because treatment areas within the HMAs would be minimal. Wild horses are accustomed to visitors and would easily move out of treatment areas until people have left.
- How will livestock management affect the success of the proposed action and will there be any effects to this use?
    - Forage manipulation is not part of the proposed action or alternatives, and BLM does not expect livestock management to affect the success of project implementation.

- What are the roles of livestock grazing management, fire suppression and changes in the fire cycle, and climate change as contributors to sage-grouse habitat loss and causes of juniper expansion?
  - The BLM recognizes that there are numerous threats to sage-grouse habitat (USDI FWS 2013a) and numerous factors contributing to the expansion of juniper woodlands; however, the focus of this proposal is to improve and maintain habitat for sage-grouse and other wildlife species through the removal of western juniper from sagebrush communities in the project area. Regardless of the causes of juniper expansion, the proposed treatments would improve habitat for sage-grouse and other wildlife species that depend on sagebrush steppe habitat.

1.4 Notable Changes between the Draft and Final EIS

A number of changes were made to the EIS based on updated project information and in response to public comments and cooperating agencies' input. Changes include:

1. Focal treatment areas were modified based upon new and improved vegetation canopy cover data (see Alternatives B, C, and C1 descriptions below; Section 2.2). Between the draft and final EIS, BLM received additional vegetation data that better identified sagebrush canopy cover levels. These new data allowed BLM to refine the model used to delineate the focal treatment areas (i.e., where juniper canopy cover is ≤20% and sagebrush canopy cover is >15%). More detail was added to quantify treatments for each alternative. Areas of Critical Environmental Concern (ACEC) that preclude the treatment of juniper were removed from the treatment area.

2. The BLM developed a new Alternative, C1 (Preferred Alternative), based on comments received on the DEIS. Cooperating agency biologists recommended expanding the project boundary to increase connectivity between three separate treatment areas and to include an additional lek (section 2.2.6) (Map 4) located in Oregon near the Idaho/Oregon border. At the same time, all wilderness areas were removed from consideration for treatments under this alternative. While the overall project area is increased by 130,000 acres, the actual acres proposed for treatment increase by 42,000 acres compared to Alternative B, and by 73,000 acres compared to Alternative C. All treatment methods, design features, and site conditions included in Alternative C1 are the same as those presented in the Draft EIS as parts of all action alternatives.

   While the new alternative proposes additional acres to be treated over a greater area, the environmental consequences of Alternative C1 are within the range of impacts disclosed in the DEIS. Therefore, supplementation of the DEIS is not warranted with the inclusion of Alternative C1 (CEQ, Forty Most Asked Questions [question 29b[1]] Concerning CEQ's

[1] 29b speaks to the possibility "that a comment on a draft EIS will raise an alternative which is a minor variation of one of the alternatives discussed in the draft EIS, but this variation was not given any consideration by the agency. In such a case, the agency should develop and evaluate the new alternative, if it is reasonable, in the final EIS. *If it is qualitatively within the spectrum of alternatives that were discussed in the draft, a supplemental draft will not be needed.*"

NEPA Regulations). None of these changes constitutes a substantial change in the alternatives relevant to the environmental concerns identified in scoping or in comments to the Draft EIS. Nor are there significant new circumstances or information relevant to environmental concerns that affect the analysis of the environmental effects of the action alternatives, including the preferred alternative. Therefore, a supplemental EIS is not necessary per 40 CFR 1502.9.

3. An analysis of carbon sequestration was added to the Final EIS (section 3.14).

1.5 Conformance with Applicable Land Use Plan(s)

The project area is subject to the 1983 Bruneau Management Framework Plan (MFP), 1999 Owyhee Resource Management Plan (RMP), and 2015 Idaho and Southwestern Montana Greater Sage-grouse Approved Resource Management Plan Amendment (ARMPA).

Bruneau Management Framework Plan (1983)
Objective WL-4.4 of the Bruneau MFP is to improve sage-grouse nesting, brood rearing, and winter habitats across 520,000 acres. The proposed project meets this objective.

Owyhee Resource Management Plan (1999)
Management direction in the Owyhee RMP includes the following to improve the ecological condition of native plant communities: implementation of juniper abatement on appropriate sites where juniper is encroaching; vegetation treatments to improve habitat where juniper density is contributing to unsatisfactory habitat conditions; and prescribed fire to reduce juniper encroachment. The Owyhee RMP also provides direction to identify, protect, and enhance key sage-grouse habitats and populations (Objective SPSS 1). Treatment of juniper meets several objectives identified in the Owyhee RMP including:

- VEGE 1: Improve unsatisfactory and maintain satisfactory vegetation health/conditions in all areas.
- RIPN 1: Maintain or improve riparian-wetland areas to attain proper functioning and satisfactory conditions. A management action includes implementing a juniper abatement plan for appropriate sites where juniper are encroaching.
- SOIL 1: Improve unsatisfactory and maintain satisfactory watershed health/conditions in all areas.
- FORS 2: Use juniper harvesting to help achieve a desired plant community.
- WDLF 1: Maintain or enhance the condition, abundance, structural stage, and distribution of plant communities and special habitat features required to support a high diversity and desired populations of wildlife.
- SPSS; Manage special status species and habitats to increase or maintain populations at levels where their existence is no longer threatened and there is no need for listing under the Endangered Species Act of 1973, as amended.
- WNES 2: Following any enabling legislation, manage designated wilderness areas to ensure an enduring wilderness resource.

- FISH 1: Improve or maintain perennial stream/riparian areas to attain satisfactory conditions to support native fish.

The Bruneau MFR and Owyhee RMP were amended by the ARMPA. The purpose of the ARMPA is to identify and incorporate appropriate conservation measures into Land Use Plans to conserve, enhance, and restore greater sage-grouse (GRSG) habitat by avoiding, minimizing or compensating for unavoidable impacts to sage-grouse habitat. Three important goals of the ARMPA are:

- "…to maintain and/or increase the abundance, distribution and connectivity of GRSG by conserving, enhancing and restoring GRSG habitat to maintain resilient populations by reducing, eliminating or minimizing threats to GRSG habitats" (Goal SSS 1), and
- "…to conserve, enhance, and restore the sagebrush ecosystem upon which GRSG populations depend in an effort to maintain and/or increase their abundance and distribution, in cooperation with other conservation partners" (Goal SSS 5).
- "…to maintain and improve lek habitat, nesting and early brood rearing habitat, and late brood rearing habitat" (USDI BLM and USDA FS 2015a).

The proposed project would also fulfill ARMPA management direction for habitat objectives to maintain and improve lek, nesting and early brood rearing, and late brood rearing habitats (USDI BLM and USDA FS 2015a). The habitat objective for lek security is that juniper would be absent or uncommon near occupied leks. The Boise District BLM completed a review specifically to ensure the action alternatives comply with the Management Decisions and objectives of the ARMPA (Appendix A).

The proposed action would fulfill many Management Decision criteria of the ARMPA including direction to:

- Reconnect and expand areas of higher native plant community integrity/rangeland health to increase the extent of high quality habitat and, where possible, to accommodate the future effects of climate change.
- Increase the amount and functionality of seasonal habitats by (a) increasing or enhancing canopy cover and average patch size of sagebrush, (b) increasing the amount, condition and connectivity of seasonal habitats, (c) protecting or improving GRSG migration/movement corridors, (d) reducing conifer encroachment within GRSG seasonal habitats, and (e) improving understory (grass, forb) and/or riparian condition within breeding and late brood rearing habitats.
- In all Sagebrush Focal Areas (SFA: stronghold areas essential for the species' survival) and PHMA, maintain all lands ecologically capable of producing sagebrush (but no less than 70%) with a minimum of 15% sagebrush canopy cover or as consistent with specific ecological site conditions (i.e., desired conditions).
- Implement habitat rehabilitation or restoration projects in areas that have potential to improve GRSG habitat using a full array of treatment activities as appropriate, including chemical, mechanical and seeding treatments.
- Implement vegetation rehabilitation or manipulation projects to enhance sagebrush cover or to promote diverse and healthy grass and forb understory to achieve the greatest

improvement in GRSG habitat based on Fire and Invasive Assessment Tool (FIAT) assessments, Habitat Assessment Framework (HAF) assessments, other vegetative assessment data and local, site specific factors that indicate sagebrush canopy cover or herbaceous conditions do not meet habitat management objectives (i.e., is minimal or exceeds optimal characteristics).

- Remove conifers encroaching into sagebrush habitats, in a manner that considers tribal cultural values. Prioritize treatments closest to occupied GRSG habitats and near occupied leks, and where juniper encroachment is in phase 1 or phase 2.

Timing restrictions (section 2.2.5 Design Features) implement ARMPA direction to avoid mechanized anthropogenic disturbance in nesting habitat during the nesting season when implementing fuels/vegetation/habitat restoration management projects. The ARMPA identifies the sage-grouse nesting season as May 1 to June 30. Through consultation with FWS, IDFG, Idaho Governor's Office of Species of Conservation, and the NRCS, the BLM interprets mechanized disturbance to mean heavy equipment such as oil rigs, sagebrush mowers, masticators, etc.

The Boise District and Idaho State Office completed a conformance review to ensure the proposed project and its action alternatives comply with the goals, management directives, and resource design features described in the ARMPA (USDI BLM and USDA FS 2015a, Appendix A).

Owyhee Canyonlands Wilderness and Wild & Scenic River Management Plan (2015)
The BOSH project meets the objective identified in the ARMPA (1.5.1.1.1 Objectives) to "Protect and preserve wildlife habitat to support healthy, viable, and naturally distributed wildlife populations to retain the wilderness areas' natural and undeveloped character."
The Plan also states, "Future unforeseen activities and proposals will be evaluated through an MRA [minimum requirements analysis] to ensure they utilize the minimum tools needed to protect or enhance wilderness character and WSR [Wild and Scenic River] values."

1.6 Relationship to Statutes, Regulations, and Other Requirements

Wildlife

The Migratory Bird Treaty Act of 1918, as amended, and Executive Order 13186 (2001)
Executive Order 13186 outline Federal agencies' responsibilities to protect migratory birds. Federal agencies were ordered to develop a Memorandum of Understanding (MOU) with the FWS. The Order directs that pursuant to its MOU, each agency shall, in harmony with agency missions:

- Avoid or minimize, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;
- Restore and enhance the habitat of migratory birds, as practicable;
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable;
- Ensure that environmental analyses of Federal actions required by the National Environmental Policy Act (NEPA) or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

- Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations.
- Develop and use principles, standards, and practices that will lessen the amount of unintentional take.
- Develop conservation efforts in cooperation with the FWS.

Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668-668c)
The Act does not permit activities and penalizes activities that result in “take” or disturbance of bald or golden eagles. In addition, the Act covers impacts that result from human-induced alterations initiated around a previously used nest site that may agitate or bother eagles upon their return that would interfere with breeding, feeding, or sheltering, or cause injury, death, or nest abandonment.

BLM and FWS Migratory Bird Memorandum of Understanding (MOU WO-230-2010-04)
In accordance with Executive Order 13186, in 2010, BLM and FWS signed BLM MOU-WO-230-2010-04 to promote the conservation of migratory birds by implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between state, tribal and local governments. Among other commitments, BLM shall, “At the project level evaluate the effects of the BLM’s actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors.” Where BLM finds negative effects, it will implement approaches lessening such take.

BLM Manual 6840
Manual 6840 directs the BLM to “carry out management activities consistent with the principles of multiple-use while conserving proposed, candidate, BLM sensitive and state species of special concern and their habitat.”

Inland Native Fish Strategy (INFISH)
Timber Management (TM) guidelines from INFISH TM-2 state: "Apply silvicultural practices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives (RMO). Apply silvicultural practices in a manner that does not retard the attainment of RMOs and that avoids adverse impacts on inland native fish." INFISH also states under Fisheries and Wildlife Restoration (FW), FW-1, "Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the RMOs.”

Special Status Plants
BLM Manual 6840
Manual 6840 directs the BLM to “carry out management activities consistent with the principles of multiple-use while conserving proposed, candidate, BLM sensitive and state species of special concern and their habitat.”

Wilderness

Wilderness Act (1964), Wild and Scenic Rivers Act (1968), and Omnibus Public Land Management Act (2009)
There are roughly 430,000 acres of wilderness within the BOSH project boundary. The BOSH Project would be conducted in a manner consistent with Section 4(d) of the Wilderness Act, Section 10(a and b) of the Wild and Scenic Rivers Act, and Section 1503(b)(8)(B) of the Omnibus Public Lands Management Act.

BLM Manual 6340
This EIS ensures "…that potential impacts to wilderness areas are appropriately analyzed in conformance with NEPA." The manual states that eight of the Prohibited Uses (commercial enterprises and permanent roads are not included) may be allowed if they are "necessary to meet minimum requirements for the administration of the area for the purpose of the [Wilderness] act." Additionally, minimum requirements analysis (MRA) using the minimum requirements decision guide (MRDG) must be made in non-urgent situations to determine whether or not…action within a wilderness is warranted."

Cultural Resources
The BLM is required to consult with Native American tribes to assure that federally recognized tribal governments and Native American individuals, whose traditional uses of public land might be affected by a proposed action, will have sufficient opportunity to contribute to the decision, and that the decision maker will give tribal concerns proper consideration. Tribal coordination and consultation responsibilities are implemented under laws and executive orders that are specific to cultural resources which are referred to as "cultural resource authorities," and under regulations that are not specific, which are termed "general authorities." Cultural resource authorities include: the National Historic Preservation Act of 1966, as amended (NHPA); the Archaeological Resources Protection Act of 1979 (ARPA); and the Native American Graves Protection and Repatriation Act of 1990, as amended (NAGPRA). General authorities include: the American Indian Religious Freedom Act of 1979 (AIRFA); Executive Order (EO) 13007, "Indian Sacred Sites"; E.O. 13175, "Consultation and Coordination with Indian Tribal Governments" and the 2016 BLM Manual, MS-1780-1, "Tribal Relations" and its accompanying handbook H-1780-1, "Improving and Sustaining BLM-Tribal Relations. " EO 13175 (Sec. 5. (a)) states that "Each agency shall have an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications". The BLM consulted with the Tribes of this area as well as the Idaho State Historic Preservation Office (SHPO), regarding this project.

National Historic Preservation Act of 1966, as amended
The 2014 State Protocol Agreement between the BLM Idaho State Director and the Idaho SHPO describes the manner in which the BLM will meet its responsibilities under Section 106 of the NHPA as provided for in the 2012 national Programmatic Agreement between BLM, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers (NCSHPO).

Section 106 of the NHPA
Section 106 of the NHPA, and the implementing regulations found at 36 CFR 800, requires federal agencies to take into account the effects of their undertakings on historic properties and

afford the tribes, SHPO, ACHP, the public, and consulting parties a reasonable opportunity to comment on such undertakings. Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior (36 CFR 800.16(l)(1).

Following consultation, federal undertakings can be conducted within these NRHP districts or sites provided they do not have an adverse effect on the resources present. However, if the federal agency chooses to adopt any course of action that will adversely affect a significant cultural resource they must allow the consulting parties the opportunity to comment per Section 106 of the NHPA and prepare a memorandum of agreement (MOA) pursuant to 36 CFR 800.6 to mitigate for adverse effects.

Other Laws, Regulations and Policies

Paleontological Resources

Protection of paleontological resources on BLM administered lands falls under a number of legislative, regulatory, and policy mandates. Principal laws include the NEPA, FLPMA and BLM regulations found in Title 43 of the Code of Federal Regulations (CFR). More recently, the Paleontological Resources Preservation subtitle of the Omnibus Public Land Management Act of 2009, also known as the Paleontological Resources Preservation Act (PRPA), directs land managers within the Department of the Interior and the U.S. Department of Agriculture to manage and protect fossils located on public lands using scientific principles and expertise. PRPA does not make a distinction between the types of organism preserved; therefore, all fossil resources, plants, invertebrates, and vertebrates that are determined to be scientifically significant are to be actively managed and protected.

Air Quality

The Federal Clean Air Act is administered in Idaho by the Idaho Department of Environmental Quality. Rules to control air pollution in the state of Idaho are set by the Idaho Administrative Procedures Act. The Environmental Protection Agency’s (EPA) policy describes elements of a smoke management program including: “(1) a process for granting approval to conduct prescribed burns; (2) methods for minimizing air pollutant emissions by considering alternative treatments and/or reducing fuel levels before burning; (3) outlining smoke management considerations for each burn, such as burning only during favorable weather conditions to minimize smoke intrusions; (4) plans to notify public and reduce exposure should smoke intrusions occur; (5) public education and awareness programs; (6) surveillance and enforcement procedures that smoke management programs are effective; and (7) procedures for periodically evaluating smoke management programs.”

2.0 Description of the Alternatives

2.1 Alternative A - No Action/Continue Present Management

The BLM would not authorize the proposed project to treat encroaching juniper in the project area.

2.2 Features Common to All Action Alternatives

2.2.1 Project Development

The proposed project was developed to provide immediate benefits to sage-grouse through the treatment of early stage juniper encroachment. The project areas were developed based on current distribution of sage-grouse, corridors between leks, and occupied leks where juniper encroachment is occurring. Numerous occupied leks (where at least two or more male sage-grouse have attended during at least one breeding season in the previous five years) are within and adjacent to the proposed project area (Idaho Fish and Game sage-grouse unpublished statewide lek database). Leks are breeding areas where males perform courtship displays, and are typically located in open areas surrounded by sagebrush, such as low sagebrush flats, ridge tops, playas, and roads (Connelly et al. 2000). Leks are usually within or adjacent to suitable nesting habitat. In Idaho, approximately 80% of hens nest within 10 kilometers (6.2 miles) of their lek of capture (Connelly et al. 2013), though some research indicates that up to 95% of sage-grouse nests are found within 10 km of leks (Holloran and Anderson 2005; Doherty et al. 2010). Based on this information, BLM and cooperating agencies identified 64 occupied and active leks which were buffered by 10 kilometers (6.2 miles) to delineate the project area.

The project objectives are to attain habitat indicators (sagebrush height and cover, grass/forb height and cover, and proper functioning condition [PFC] of riparian areas) in the suitable range for breeding, upland summer/late brood rearing, and riparian summer/late brood rearing habitats (per the *Sage-Grouse Habitat Assessment Framework [HAF] Technical Reference 6710-1* suitability indicators). Objectives would be met within <1 to 10 years following treatments depending on level of encroachment. By meeting these habitat suitability objectives, the goal to improve and maintain suitable, functioning sage-grouse habitat in the project area would be met. The BLM anticipates project implementation to commence fall of 2018 and to take 10-15 years to complete.

2.2.2 Focal Treatment Area Development

The ARMPA identifies priority sage-grouse habitat as having a minimum of 15% canopy cover of sagebrush. The BLM used the modeling tool to identify focal treatment areas (areas with ≤20% juniper canopy cover and ≥15% sagebrush canopy cover) to target for juniper removal and provide the greatest, most immediate benefit for sage-grouse and sagebrush steppe habitat. These vegetation canopy cover layers helped BLM to better illustrate current habitat conditions across the landscape and to target treatments in areas that would provide the greatest benefits to sage-grouse.

The focal treatment areas within the proposed project area boundary were developed using the classifications of juniper/woodland succession (Miller et al. 2005) and GIS modeling. The level of juniper encroachment (or stage of woodland succession) is commonly identified as phase I, II, or III (Miller et al. 2005) (Table 2). In phase I, shrubs and herbaceous plants are the dominant vegetation types influencing ecological processes on the site. In phase II, juniper is co-dominant with shrubs and herbaceous vegetation and all three vegetation types influence ecological processes on the site. In phase III, juniper is the dominant vegetation and the primary plant layer influencing ecological processes on the site (Miller et al. 2005).

Table 2 – Tree (Juniper) Canopy and Shrub Layer Characteristics for Encroachment Phases.

Characteristics	Phase I	Phase II	Phase III
Tree Canopy	Open, actively expanding <10%	Actively expanding 10- 30%	Expansion nearly stabilized >30%
Shrub Layer	Intact	Nearly intact to significant thinning/suppression of sagebrush	≥75% die-off

Areas of phase I and early phase II juniper encroachment (early stage) were selected as the primary targets for treatment because they would provide suitable sage-grouse habitat immediately following treatment (i.e., there would be adequate levels of sagebrush and herbaceous plant cover following juniper removal). For the purpose of this project, the BLM concluded that the mid-point of phase II (20% canopy cover of juniper) represented the point where sagebrush and juniper are equally driving ecosystem function and this is identified as early stage juniper encroachment for this project. By removing juniper at less than or equal to 20% canopy cover or early stage, there would be sufficient understory of desirable vegetation to immediately benefit sage-grouse.

To develop the GIS model that would detect areas for treatment (i.e., focal treatment areas), an automated analysis of aerial imagery was used to estimate juniper canopy cover in sagebrush communities in the project area. The model utilized a 1-kilometer moving window to identify areas with greater than 50% of the landscape in sagebrush that also had at least 1% of the landscape with juniper canopy cover ranging from 1% to 20%. The most recent vegetation data[2] for the Boise District was used to determine presence of sagebrush. Tree canopy cover for Owyhee County was obtained from the USDA NRCS Sage Grouse Initiative for Idaho.

As a result, the GIS model identified the focal treatment area for each alternative (section 2.3 Comparison of Action Alternatives). Due to the smoothing effect of the moving window neighborhood analysis, the model captured areas with very small or widely scattered juniper (>0-1% canopy cover; i.e., early phase I) in the focal treatment areas; these areas would be treated because they meet the criteria for juniper removal outlined below (Treatment Focus). Similarly, small areas with juniper canopy cover greater than 20% (late phase II to phase III) have also been included in the focal treatment areas; these areas would not be treated unless they meet the criteria identified below (Treatment Focus).

Juniper treatments would be focused within an identified focal treatment area for each alternative. However, the BLM anticipates that treatments may not occur in some sections of the focal area because it would be infeasible to do so (e.g., due to steep topography), or treatment criteria are not met. Additionally, the 2015 Soda Fire burned approximately 182,000 acres of the project area (Map 5). The burned area may warrant treatment during the latter part of the project if/as juniper recolonizes this area; therefore, these acres are still included in the project area total.

[2] A dataset classifying vegetation cover was developed for the Boise District from 2000-2001 Landsat imagery and was used to portray sagebrush distribution within the project area. All sagebrush cover types were extracted and reclassified to create a simple sagebrush occurrence layer. Recent fire history (2001-2014) polygons were used to erase sagebrush pixels with those polygons to reflect vegetation changes since the satellite imagery was acquired.

Further, maintenance of treatment areas would occur over time when juniper begins to re-establish in treatment areas.

Treatment Focus

The BLM would target western juniper with <20% canopy cover within 10 km (6.2 miles) of leks and areas that would increase connectivity between leks within the project area. The proposed 10 km (6.2 mile) treatment area surrounding leks meets the ARMPA seasonal habitat objectives for maintaining lek security, nesting/early brood rearing habitat, and late brood rearing/summer habitat where it is present within the treatment area. Juniper killed by wildfire in the project area would also be removed as juniper skeletons could remain standing for decades and sage-grouse may avoid the area, even after sagebrush has re-established.

While areas with greater than 20% canopy cover are not the primary target, there are circumstances where these areas would warrant treatment (Figure 1). The decision to remove juniper in the later stages of encroachment (greater than 20% canopy cover) would be based on the following criteria:

- Juxtaposition to important sage-grouse habitat (e.g., leks, migration corridors, spring sites important for brood rearing),
- Late stage treatment areas would not exceed 5 acres in size, and
- In plant communities considered moderate or high Resistance and Resilience (refer to section 3.3 for a description); mapped R&R is coarse in scale so determinations would be made following on-site examinations.

Sites with greater than 20% canopy cover of juniper typically have less shrub and herbaceous cover, and may not provide sage-grouse habitat for several years after treatment. Therefore, treatment of these denser stands that meet the above criteria may require seeding or seedling planting depending on location, site conditions, and treatment method utilized. See Design Features (section 2.2.5) and descriptions of the treatment proposals below (sections 2.4 – 2.6).

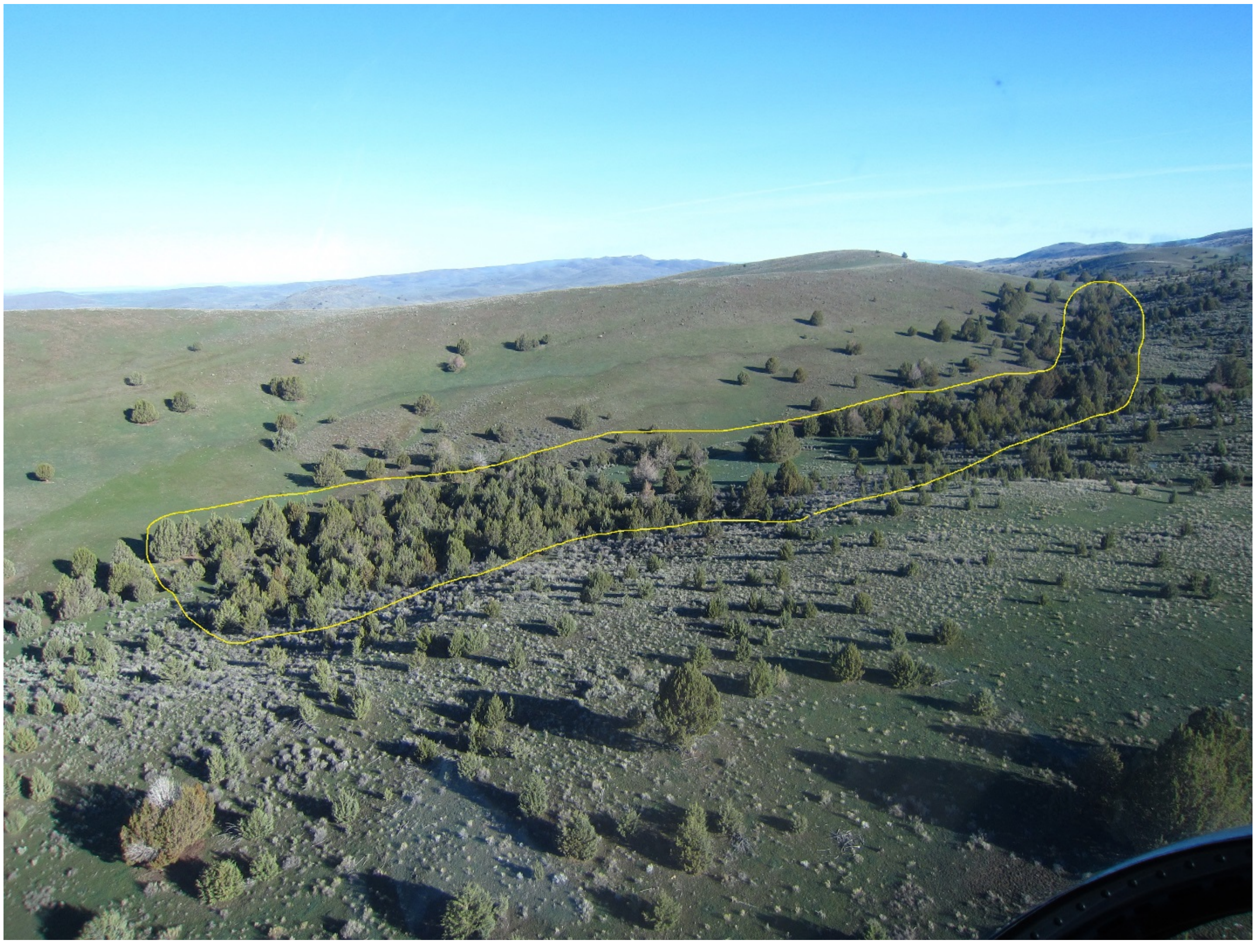

Figure 1 – Late stage/phase juniper encroachment that may be treated.

Figure 1 illustrates an area of late stage encroachment less than or equal to five (5) acres. These areas may be targeted for treatment when they are present near mesic areas that once treated, would provide suitable brood rearing habitat or to improve migration corridors between seasonal habitats. There are hundreds of springs mapped in the project area. Some of these springs contain no late stage juniper and require no treatment, while others will be heavily encroached upon, and therefore, not suitable for treatment. Even if all the springs in the preferred alternative were treated, it represents only a minute fraction of the project area. For instance, there are 600 springs mapped in the focal treatment area where small patches (≤5 acres) of late stage juniper may be treated; combined, these patches total approximately 3,000 acres or 0.4% of the focal treatment area.

Juniper treatments would occur within focal treatment areas delineated with the GIS model (see section 2.2.2 below). However, there may be portions of the focal areas that are not treated because it would not be feasible to do so, or the areas do not meet the treatment criteria (e.g., more juniper present than modeled).

2.2.3 Annual Project Development – Treatment Units

Treatment units would be approximately 40,000 to 60,000 acres in size depending on annual budget. Treatment units would be delineated using aerial photography, GIS data (lek locations,

riparian locations, vegetation mapping) and site information garnered from previous field visits. Units would be further refined based on information collected from on-the-ground assessments, clearance surveys, sage-grouse monitoring, and project layout efforts.

Collaborating agencies (IDFG, NRCS, FWS, IDL, and Idaho Governor's Office of Species of Conservation) would be instrumental and involved in identifying priority areas for treatment, project units, and layout. To maintain regular communication with these agencies, BLM would hold meetings and field visits to discuss project implementation and seek input on the results and how things could be improved. BLM would seek to make all significant project decisions collaboratively, such as unit boundaries, prioritization of treatment units, so that no significant project decisions would be made unilaterally.

Prior to implementation, a 40,000- to 60,000-acre treatment unit would be delineated within the focal treatment area by the BLM and provided to collaborating agencies. This would be followed up with a site visit with collaborators to discuss the layout and any site specific concerns, such as late brood rearing areas. Once the unit boundaries and site specific areas of concern have been identified, the most appropriate treatment methods for a given unit/area would be identified during the layout phase.

Prior to project implementation, all the necessary resource clearances/surveys and assessments would be completed and documented on the Unit Planning Form (Appendix B). The Unit Planning Form would be completed and then signed by the Field Office Managers.

Clearances required prior to implementation would include cultural resources, sensitive plants, sensitive wildlife, and riparian areas on perennial fish bearing streams. A project report would be prepared and made available to the public annually during the life of the project. At a minimum, the project report would identify the units, number of acres treated, acres treated by method (cut and leave, jackpot burning, pile burning, phased treatment, mastication), monitoring results, changes made through adaptive management, Unit Planning Forms and any other pertinent information.

The BLM would determine treatment unit priorities based on land use plan direction and in coordination with IDFG, NRCS, and FWS biologists. Priorities and treatment areas may be adjusted based on information gathered from project-associated research, areas burned by wildfires, input from collaborators, or other factors over the life of the project. Planning of each unit would incorporate seasonal timing restrictions and other restrictions such as areas of cultural or botanical concern.

2.2.4 Methods

Treatment methods would include cutting juniper[3] with handsaws or chainsaws, lopping with pruning shears, and using heavy equipment such as a track-hoe fitted with a grinding implement (masticator) or a shearing implement (large, powerful pruning shears). Material may be scattered on site and left in place, or the material may be piled and burned or jackpot burned.

[3] Old growth juniper would not be treated regardless of encroachment phase, proximity to leks, or proximity to sage-grouse migration corridors. See Juniper Cutting standard operating procedures.

Cut juniper would be burned in areas near roads for public and fire fighter safety, areas where viewshed issues are a concern, and/or areas where fuel loading is a concern. Burning may also be completed to remove slash from meadow areas that would provide suitable brood rearing habitat. Figure 2 illustrates where jackpot or pile burning would be suitable to deal with high levels of juniper biomass (fuels) near a meadow complex. Jackpot and pile burning would take place once the juniper biomass has dried sufficiently and when soils are moist, frozen, or covered by snow. Burning under such conditions reduces the risk of fire spreading and mortality of adjacent vegetation as well as faster vegetation recovery (Bates et al. 2006; Bates and Svejcar 2009; Bates et al. 2014; Roundy et al. 2014a).

Juniper felled near roads could pose a safety hazard to the public and firefighters as the needles dry and become highly combustible. Juniper trees within 60 meters (200 feet) of roads may be jackpot or pile burned to reduce hazardous fuel loading, or they may be removed for commercial use. Mastication, shearing, or other machinery (excavator to pile material for burning) would also be used within 60 meters (200 feet) of existing roads where practical and allowable (based on design features, etc.). Mastication of juniper trees along roads greatly reduces the potential fire behavior (flame length and spread) because the chips and needles (i.e., fuels) would be at ground level.

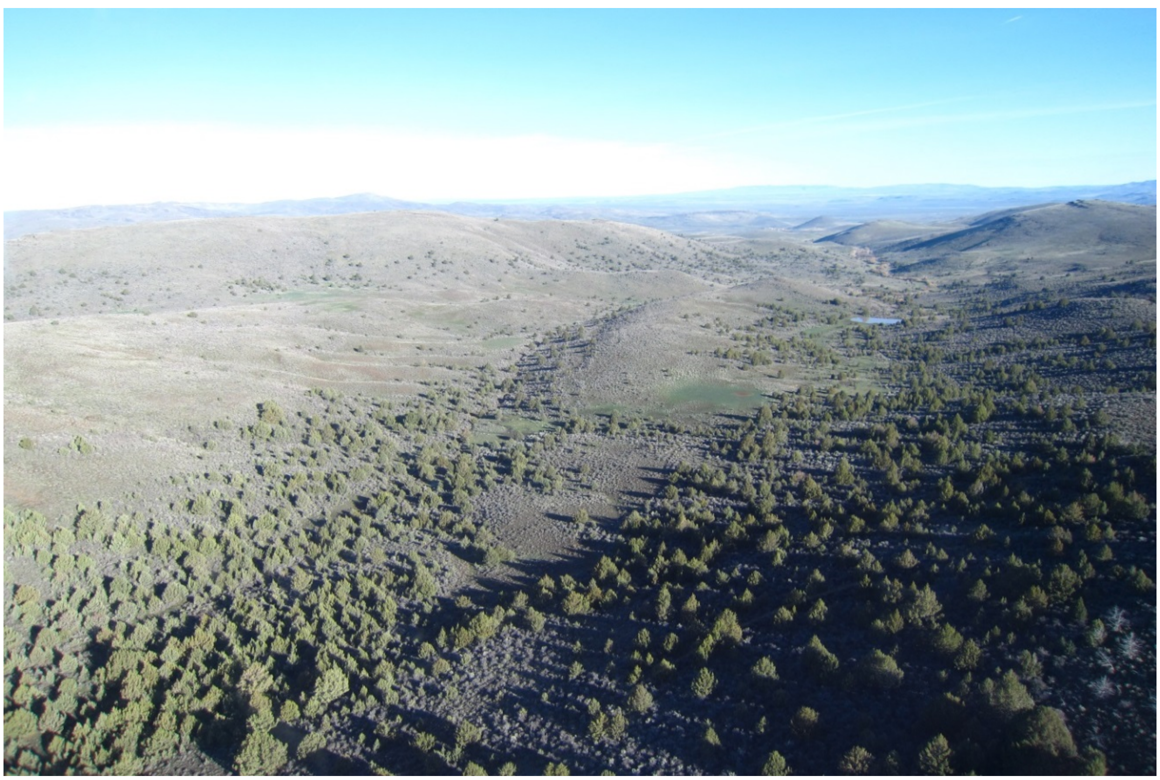

Figure 2 – An example of where jackpot or pile burning of juniper debris would be used near a meadow complex to provide suitable brood rearing habitat. All juniper would be cut in this meadow complex including the small stand of late stage juniper encroachment in the lower left hand corner of the photo.

In areas where soils are exposed post-treatment (e.g., following pile burning in uplands or juniper removal in riparian areas), small scale, hand broadcast seeding and/or seedling planting may be used to facilitate vegetation recovery.

In some locations treatments may be completed in multiple phases to minimize resource concerns. For example, treatments in riparian areas may be implemented incrementally to ensure that adequate shade remains as riparian vegetation becomes established (see design features below, section 2.2.4). Treatments in a viewshed may also be implemented in phases. Removing juniper gradually would make visual changes to the viewshed less noticeable.

Different methods may be introduced over the life of the project as new technologies for juniper treatment and disposal are developed, and to integrate results of ongoing research. Appropriate NEPA analysis of new or different methods would occur as needed.

Project implementation would be completed in accordance with the following standard operating procedures:

Vehicle Use

- Pickups and support vehicles would be restricted to established roads and trails.
- Rubber-tired all-terrain vehicles (ATVs) and utility task vehicles (UTVs) may travel off-road to access trees; no ATV/UTV use of any kind will be permitted in wilderness.
- ATV/UTV use would be restricted where necessary to protect sensitive plant and animal populations and cultural resources, or avoid noxious weed locations.
- Only single-pass cross-country travel by ATVs/UTVs would be allowed to avoid creating trails or visible tracks.
- Cross-country travel by ATVs/UTVs would not be permitted when soils are saturated; travel would only occur when soils are firm.

Juniper Cutting

- Trees would be cut to a stump height of eight inches or less.
- No live branches would remain on the stump.
- Camping areas for cutting crews would be pre-approved by authorized officer.
- Branches would be lopped from felled juniper to a height of no more than 1.22 meters (4 feet).
- Old growth, trees of cultural significance, and bearing trees would be avoided.

Pile and Jackpot Burning

- The BLM would only initiate burning with the approval of the Idaho/Montana Airshed Group, and when there are no restrictions from local regulatory authorities (e.g., Regional DEQ Office, Boise, ID). All burning activities would comply with the smoke management program for the State of Idaho which is regulated by Idaho-Montana

Airshed group and the Clean Air Act, and air quality effects would not exceed the National Ambient Air Quality Standards (NAAQS).

- The BLM would burn cut juniper in the late fall through early spring when conditions allow only the targeted concentration of treated fuels (juniper material and debris) to be burned and not the surrounding live vegetation. Environmental conditions that prevent the spread of fire outside of the pile or jackpot fuels include snow covered or frozen ground, recent measurable rainfall, or substantial green-up of grasses with minimal fine dead fuels (grasses) present.
- Pile Burning is prescribed fire used to ignite hand or machine piles of cut juniper. Cut material is piled and the fire is confined to the footprint of the pile. Pile burning allows time for the vegetative material to dry out and will produce less overall smoke by burning hot and clean.
- Jackpot burning is prescribed fire which consists of burning cut juniper where it is felled without further concentrating fuel loads by piling. Jackpot burning only targets the cut and limbed juniper material and debris and is confined to a given area.

Mastication and Shearing

- Mastication and shearing of juniper would be used where it would be the most effective tool within 60 meters (200 feet) from either side of designated roads, for example:
    - To reduce fuel loading along roadways;
    - Trees may be masticated where viewsheds are a concern.
    - Heavy equipment would not be permitted beyond the 60-meter (200-foot) corridor along roadways, and would not be permitted in riparian/wetland areas.

Resource Clearances

- It is BLM's standard operating procedure to complete resource inventories/surveys (or "clearances") prior to treatment implementation (clearances are typically initiated during the project planning phase, and are completed prior to project implementation). Resources clearances ensure that specialists can determine precise locations of avoidance areas and/or where to apply other design features to protect resources.

2.2.5 Design Features

The following design features were developed to minimize or eliminate adverse impacts by the proposed action to identified resources:

Cultural and Paleontological Resources

- All cultural resource inventories would be conducted in accordance with the Idaho State Protocol Agreement between the Idaho State Director of the Bureau of Land Management and the Idaho State Historic Preservation Officer (herein after called ID State Protocol) dated 2014, or most current agreement if/when updated.
- Tree cutting within cultural sites will be determined on a site by site basis.

- No slash pile burning or jackpot burning will occur in any unevaluated or National Register of Historic Places (NRHP) eligible archeological site or in a paleontological site.
- Limbs and trunks of juniper must be removed and piled outside any paleontological, cultural or archaeological site before burning is initiated. No dragging of limbs or trunks through the site would be permitted.
- Juniper debris removed from paleontological, cultural or archaeological sites will be piled at least 10 meters (33 feet) from the site boundary.
- Seedling planting within an unevaluated or NRHP eligible archaeological site or paleontological location will be determined on a site-by-site basis. In no instances will planting be allowed when soils are saturated.
- Camping areas for cutting crews would be identified and surveyed for cultural resources prior to use of that camp location.
- Track-hoe equipment will not be allowed to drive through any unevaluated or eligible archeological site or a paleontological site.
- Turning any vehicle within a paleontological, cultural or archaeological site will not be allowed.
- Cross-country travel will only be allowed by rubber-tired vehicles (under 10,000 pounds GVW) and may only make a single pass in areas where inventory is completed and appropriate site avoidance measures are in-place (ID State Protocol Exemption C.37). In areas where inventory has been completed and no unevaluated or significant cultural resource sites were identified the single pass restriction and vehicle GVW restriction would not apply.
- Treatments in paleontological sites would be evaluated on an individual basis.

Wilderness

Per the minimum requirements decision guide's (MRDG) minimum requirements analysis:

- BLM would use handsaws to implement treatment within designated wilderness as determined through a minimum requirements analysis (applies to Alternative B only; Alternative C excludes juniper treatments in wilderness).
- All motorized travel would be restricted to designated roads; juniper treatments would be done on foot.
- Only trees ≤ 20cm (8 inches) diameter at breast height (DBH) would be treated.

Wildlife

- No repeated or sustained disturbance to lekking sage-grouse from 6:00 pm to 9:00 am within 3.2 km (2 miles) of leks during the lekking season, determined locally, but typically March 15 to May 1 at lower elevations (USDI BLM and USDA FS 2015).

- No juniper cutting would occur from May 1 through July 15 to prevent disturbance and impacts to nesting sage-grouse, migratory birds, and large ungulate fawning and calving (USDI BLM 2010; USDI BLM and USDA FS 2015)[4].
- Potential impacts to bighorn sheep lambing areas would be avoided between April 15 and June 15 (USDI BLM 2010).
- No treatment of juniper from November through February in sage-grouse winter habitat (USDI BLM and USDA FS 2015) without prior consultation and agreement with IDFG.
- Juniper treatments may occur in big game winter range from November through April. The decision to treat in big game winter range would be based on animal presence or absence, animal condition, weather severity, habitat condition and availability, site location, and timing in consultation with IDFG.
- Prior to actions which have the potential to disturb raptors during the nesting period from February 1 through July 31 (USDI BLM 2010), surveys for raptor nesting activity would be completed from January 1 through May 31, according to the nesting period and habitat availability of various raptor species. Surveys would be conducted following standard protocols as described in Smith and Slater (2009) within treatment units and extend outward from unit boundaries to a radius of 1.6-kilometers (1-mile) for golden eagles and ferruginous hawks. Occupied ferruginous hawk and golden eagle nests (defined as a nest containing eggs, young, an incubating bird, a nest that has been recently repaired, or a nest with a pair near it) would be protected by establishing a 1.6-kilometer (1-mile) buffer. Occupied nests of other raptor species that may occur in the project area would be buffered by 400-800 meters (0.25-0.5 miles), depending on species (USDI BLM 2010). All raptor nest buffers would remain in effect from time of occupied nest identification through July 31, unless the nest is abandoned, destroyed (wind, lightning, wildfire), or the young fledge before July 31.
- Pile and jackpot burning would occur late fall to spring. For jackpot burning in March and April, disturbance buffers would be maintained for nesting raptors, as specified above, unless other factors such as topography or dense vegetation warrant a different disturbance buffer approved by the FO manager (with input from FO/BLM biologist and FWS).

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[4] Sources for specific timing restrictions:
For *sage-grouse*, avoid anthropogenic disturbance in nesting habitat May 1-June 30 (USDI BLM and USDA FS 2015) and until July 15th (USDI BLM 2010);
For *large ungulate fawning and calving*, “apply seasonal restrictions for potentially disruptive construction or other activities” for elk and deer May 1-June 30, and for pronghorn May 15-June 30 (USDI BLM 2010);
For *migratory birds*, “avoid nesting season during rangeland improvements and implement approaches lessening take” under the Migratory Bird Treaty Act (MOU WO-230-2010-04) and “carry out management activities … while conserving proposed, candidate, BLM sensitive and state species of special concern and their habitat” (BLM Manual 6840). The peak breeding season for migratory birds, particularly sagebrush-obligates, would be May 1-July 15. Design features for raptors are listed separately.

- No heavy equipment would be used within 300 meters (0.2 miles) of currently occupied pygmy rabbit habitat, as determined by surveys in potential habitat prior to ground disturbance.
- No heavy equipment use within 800 meters (0.5 miles) and no juniper cutting within 400 meters (0.25 miles) of known, large (i.e., > 100 bats) bat maternity colonies from May through August.

Hydrology and Fisheries

- No heavy equipment use (e.g., masticators) or staging in riparian/wetland areas.
- Fueling of chainsaws would be done outside of riparian areas (streams, wetlands, wet meadows, springs, etc.).
- Sediment control measures would be implemented where necessary when juniper cutting activities occur adjacent to redband trout streams.
- Willows may be planted to facilitate recovery of riparian systems and to stabilize banks.
- Where willows are planted, plastic sheaths or felled juniper may be positioned to protect the willows from livestock and big game.
- BLM may use a phased approach in riparian systems to reduce the potential of negative impacts. For instance, if removing all of the juniper from a meadow section of a stream would leave more bare areas than desirable, some juniper may be left un-cut until riparian and other desired vegetation establishes; BLM would then treat the remaining juniper on that site once the site has stabilized.
- Juniper may be felled over streams where banks are stable to provide shade and cover for fish.
- When juniper treatment occurs in riparian areas with low vegetative cover or bare soil, branches and boles would be left on site to minimize erosion potential and protect recovering vegetation from livestock and big game.
- If juniper treatment occurs adjacent to unstable banks (e.g., collapsing or steep unvegetated banks), the felled trees would be used to stabilize banks (Matney et al. 2005).
- Burning of juniper materials would not occur within the riparian greenline of perennial streams, meadows, and seeps.

Vegetation

- Native forb and grass seed (adapted to the site) may be broadcast at jackpot or pile burn sites and/or other areas deemed susceptible to weed spread due to treatment activities to facilitate establishment of desirable vegetation.

Special Status Plants

- All known Special Status Plant (SSP) Element Occurrence (EO) “avoidance areas/buffers” would be mapped (hard copy and/or on GPS devices) and/or marked with

flagging prior to and during treatment operations where impacts to SSP species may occur (See section 3.3.1 for a description SSP EOs).

- Special Status Plant Surveys and reporting will follow Idaho IM 2017-011 Special Status Plant Project Survey and Clearance Protocol, or subsequent IM protocols that supersede this.
- ATVs/UTVs would avoid SSP EOs during cross-country travel.
- Machinery used to pile juniper debris (e.g., track hoe) for burning would avoid SSP EOs when traveling to and from treatment areas.
- Mastication and shearing operations would not occur within 15 meters (50 feet) of SSP EOs; buffer may be increased based on site conditions (TBD by botanist)
- Pile burning of juniper debris would not occur within 60 meters (200 feet) of SSP EOs; buffer distance may be increased based on site conditions (TBD by botanist)
- Jackpot burning would not be allowed within 150 meters (500 feet) of SSP EOs. However, this buffer may be contracted depending upon site conditions (e.g., geographic barrier protecting plant occurrence, very high fuel moistures ensuring plants will not burn, phenological considerations – plants have completed life cycle and have dispersed seeds/died [annuals] or plants have senesced [perennials] and/or have yet not germinated [annuals and perennials]). Conversely, the avoidance buffer may also be expanded based on these same considerations if site conditions increase the risk of impacts to plant occurrences: geographic features, fuel moisture levels, phenology (e.g., plants actively growing, flowering, fruiting, etc.), and/or based on proximity of invasive weeds, roads and other weed corridors. (TBD by botanist).

Noxious Weeds and Invasive Plants

- Juniper treatment areas would be inventoried (and previous weed treatments monitored) for noxious weeds prior to implementation in areas of concern (per consultation with the District Weeds Specialist).
- Areas considered susceptible to noxious weed spread would be monitored and treated (chemically or otherwise) post-juniper treatment.
- Noxious weeds may be treated before or after juniper treatment depending on the target species and type of herbicide, or be avoided to the extent possible to reduce the risk of spread.
- Chemical treatment of noxious weeds would adhere to the Boise District Noxious Weed EA (EA#ID100-2005-EA-265) and the Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS (USDI BLM 2007), or subsequent decisions that supersede/replace this.
- Juniper treatment equipment (masticators, trailers), including vehicles (trucks and ATVs/UTVs) would be thoroughly inspected and washed prior to use in the project area to reduce the potential for noxious weed or invasive species spread. Inspection and washing of equipment, etc. would be documented in project implementation records.

2.2.6 Treatment Maintenance

The BLM anticipates that maintenance of treatments areas would need to occur across the project area. Based on growth rates published by Miller et al. (2005), retreatment would likely be required in 5-10 years. Retreatment would be far less costly than the proposed initial treatment because trees would be fewer, smaller, and require less post cut handling (e.g., removal of large branches). Subsequent treatments would likely be required around 25-30 years following the second treatment and would be covered under a separate NEPA analysis.

2.2.7 Monitoring

Monitoring techniques and methods would comply with prevailing BLM policy for fuels program projects (e.g., AIM strategy/process). Implementation and effectiveness monitoring would be used to inform management whether treatments are achieving desired goals and/or whether changes (e.g., to design features, techniques, treatment target areas, etc.) are necessary. Results of monitoring would be the driver for adaptive management. If monitoring indicates that changes in treatment methods are warranted that are outside the scope of this NEPA, new NEPA would be completed. See Appendix C – Monitoring Plan for details.

Implementation Monitoring

Implementation monitoring documents resource conditions during implementation (e.g., disturbance or lack of disturbance to a resource), equipment issues, and/or resolutions, and any necessary adjustments to the prescribed designs. Treated areas would be GPSed to allow for evaluation of the project's progress over time. The BLM would conduct inspections during project operations to document adherence to design features and best management practices, and to ensure proper implementation of the treatment plan (e.g., number of acres and methods employed). Information derived through implementation monitoring would be used to correct ongoing operations as necessary and to improve future annual treatment unit development and design.

Effectiveness Monitoring

Monitoring would be conducted to determine treatment effectiveness. If monitoring detects undesired impacts (e.g., a downward trend) to a resource or resources, adjustments would be made to address and alleviate these impacts/issues, and to avoid them in the future.

Sage-grouse

Project implementation would take approximately 10 to 15 years, providing the opportunity for long-term monitoring and scientific studies. To document sage-grouse response to juniper treatments, the BLM is working with the University of Idaho and other agencies on a radio-telemetry project. Monitoring of sage-grouse would focus on, but would not be limited to, the following:

- Response to and use of treated areas
- Migration or other movement patterns
- Seasonal habitat availability and use
- Lek attendance
- Use of spring sites for brood rearing
- Changes in nesting areas

- Survival

Sage-grouse Habitat

Sage-grouse habitat would be monitored by documenting vegetation trend utilizing the Site Scale habitat assessment and monitoring protocols identified in the Sage-Grouse Habitat Assessment Framework (HAF 2015). Other standard vegetation monitoring would be conducted (i.e., line intercept, basal gap, canopy gap, and photo plots) to evaluate the vegetation response and effectiveness of the project.

Other Resources

The BLM would monitor ongoing treatment response for other resources of concern. Types of monitoring may include, but not be limited to, the following:

- Hydrologic response
- Riparian vegetation response
- Water temperature
- Migratory bird species
- Pygmy Rabbit

Monitoring plans would be designed and included for each treatment unit (see Annual Treatment Unit Development, section 2.3.2.4 above). For example, mesic areas (e.g., wetlands) would be monitored following treatments to determine if habitat indicators are achieving HAF objectives for late brood rearing habitat (see Appendix C). Inventories of and surveys for noxious weeds, special status and other plants, wildlife, and cultural sites would be ongoing.

2.2.8 Adaptive Management and Goals

Adaptive management is a system of management practices based on clearly identified outcomes. Monitoring would be used to determine if management actions are meeting outcomes, and, if not, monitoring would be used to facilitate management changes that would best ensure outcomes are met. This learning process builds on current knowledge, observation, and experimentation. A continuous feedback loop allows for mid-course corrections in management to meet planned objectives. In addition, the process provides a model for adjusting objectives as new information is made available. As a landscape-level project is implemented, opportunities to fine-tune treatments and approaches increase due to the scale of the project and length of time required until full implementation. Experience gained during earlier phases of implementation can result in better management practices. Project implementation flexibility is necessary for addressing and adapting to issues, situations, and new knowledge which can emerge during implementation activities. Adaptive Management Goals include:

- Support the overall objectives of and meet the purpose and need of the ARMPA
- Fulfill management direction in found in the Owyhee RMP and the Bruneau MFP as amended by the ARMPA

For example, if monitoring identifies that mastication of juniper where canopies are approaching 20% slows vegetation recovery, mastication may be limited to areas of 10% or less canopy cover. Any changes to project implementation would be within the scope of this analysis, and any changes would be documented in the annual project report.

2.3 Comparison of Action Alternatives

Table 3 compares the acres estimated for treatment for each action alternative by the methods described in section 2.2.4. Cut and leave treatments would be completed in all areas with a juniper canopy cover of >0 to 10%. Jackpot burning would occur in areas with a juniper canopy cover of 10% to 20%. Juniper within 200 feet of roadways (up to 20% canopy cover) may be felled and masticated or sheared. Juniper felled adjacent to roads may be piled and burned or jackpot burned to remove hazardous fuel determined to pose a risk to the public or firefighters. Interior jackpot (or pile) burning would be based on sage-grouse needs (spring sites, migration corridors).

Table 3 – Focal treatment acres[1] by alternative and method.

Juniper Treatment Type	Estimated Treatment Acres (% of Focal Treatment Area)		
	Alt B	Alt C	Alt C1
Cut and leave (>0-10% cover)	598,000 (87%)	567,000 (87%)	622,000 (86%)
Jackpot Burning (interior) (10-20% cover)	79,000 (12%)	79,000 (12%)	96,000 (13%)
Various (w/in 200 feet of roads) (≤20% cover)	7,000 (1 %)	7,000 (1%)	8,000 (1%)
TOTALS	684,000 (100%)	653,000 (100%)	726,000 (100%)
Project Area Acres	*1.54 million*	*1.54 million*	*1.67 million*

[1]The acres presented here are derived from the model (see modelling discussion in section 2.2.2) and are the maximum acres that would be treated. Approximately 70% of the acres identified for "cut and leave" have a juniper canopy of <1% indicating that juniper trees are small and/or widely spaced.

Table 4 indicates the acres of priority habitat, important habitat, and general habitat management areas (PHMA, IHMA, and GHMA) in the focal treatment areas for each action alternative.

Table 4 – Acres in each sage-grouse habitat management area within focal treatment areas by alternative.

HMA Category[1]	Alt B Acres	Alt C Acres	Alt C1 Acres
PHMA	371,000	346,000	356,000
IHMA	201,000	201,000	231,000
GHMA	92,000	86,000	113,000

[1]Not every acre in the focal treatment areas is mapped as one of the habitat management area types; therefore, acres in this table are slightly less than the total treatment acres in Table 3.

2.4 Alternative B – Treatment Including Wilderness

The BLM would remove encroaching juniper on 684,000 acres under Alternative B. Treatments would be completed using the methods and standard operating procedures described in section 2.2.4 and design features outlined in section 2.2.5. Total treatment acres and acres by treatment methods are identified in Table 3 above. Roughly 598,000 acres (87% of the focal treatment area) of the treated area would be cut and leave, 79,000 acres (12% of the focal treatment area) would be jackpot burned or piled and burned, and juniper on 7,000 acres within 200 feet of roads (1% of the focal treatment area) could be felled and masticated or felled and burned. The focal treatment area includes approximately 371,000 acres of sage-grouse PHMA, 201,000 acres of IHMA, and 92,000 acres of GHMA (Table 4). Based on timing restrictions for wildlife, treatment of juniper would be permitted from July 16 through April 30 annually.

Treatment in Wilderness

Approximately 31,000 acres of wilderness are designated for treatment under this alternative. The 31,000 acres of wilderness is included in this alternative because it contains roughly 24,400 acres of PHMA and 6,000 acres of GHMA for sage-grouse; in other words, 79% of wilderness in the focal treatment area is PHMA and 19% is GHMA.

Only areas with less than 10% juniper canopy cover and trees less than or equal to 8 inches in diameter at breast height (DBH) would be treated. Juniper would be cut using handsaws and branches would be scattered. No mechanized equipment or burning would be permitted in wilderness. All methods would be implemented according to the design features outlined in section 2.2.5.

Treatment of Later Phase Juniper Encroachment

While areas with less than 20% juniper canopy cover are the primary target for treatment, there are circumstances where areas exceeding 20% juniper canopy cover would warrant treatment (i.e., proximity to important sage-grouse habitat including leks, migration corridors, and spring sites important for brood rearing) (section 2.2.1 Project Area Development). Late stage treatment areas would not exceed 5 acres in size, and would occur in plant communities considered moderate or high Resistance and Resilience (refer to Vegetation, section 3.3 for a description of R&R).

2.5 Alternative C – No Treatment in Wilderness

The BLM would target treatment of juniper on approximately 653,000 acres under this alternative (Table 3). Treatment timing, methods, and design features would be identical to Alternative B and as described in sections 2.2.4 (Methods) and 2.2.5 (Design Features). Juniper removal treatments would occur within the same project area and focal treatment area identified for Alternative B, except there would be no treatment in wilderness (31,000 acres) (Map 3). Roughly 567,000 acres (87% of the focal treatment area) would be cut and leave, 79,000 acres (12% of the focal treatment area) would be jackpot burned or piled and burned, and juniper on 7,000 acres (1% of the focal treatment area) within 200 feet of roads would be felled and masticated or felled and burned (Table 3).

Approximately 346,000 acres of PHMA, 201,000 acres of IHMA, and 86,000 acres of GHMA would be treated under this scenario (Table 4).

Treatment in Late Phase Juniper Encroachment

Prioritization and treatment in late phase juniper encroachment areas would be as described for Alternative B.

2.6 Alternative C1 – Preferred Alternative

Alternative C1 was developed in response to comments made by collaborating agency biologists asking to include an additional lek within the project boundary and emphasizing the need to ensure connectivity between the treatment areas (Map 4). Habitat connectivity between leks is critical for maintaining and improving high functioning habitat for sage-grouse across the landscape. As a result, the project area for Alternative C1 includes approximately 1.67 million acres with a focal treatment area of 726,000 acres (Table 3, Map 4). Treatment timing, methods, and design features would be identical to Alternatives B and C and as described in sections 2.2.4

(Methods) and 2.2.5 (Design Features). The BLM would treat an estimated 622,000 acres (86% of the focal treatment area) using cut and leave treatments (Table 3). Jackpot or pile burning (>200 feet from roads) may be completed on a maximum of 96,000 acres (13% of the focal treatment area). Treatment within 200 feet of roads would include felling and masticating or felling and burning juniper on approximately 8,000 acres (1% of the focal treatment area).

Approximately 356,000 acres of PHMA, 231,000 of IHMA, and 113,000 acres of GHMA are included in the focal treatment area (Table 4). No treatments in wilderness are proposed under this alternative.

Treatment of Late Phase Juniper Encroachment
Prioritization of treatment in late phase juniper encroachment areas would be identical to alternatives B and C. Treatment of late stage juniper would occur as described under Alternative B.

2.7 Alternatives Considered but Not Analyzed in Detail
The following alternatives were considered, but not analyzed in detail:

All Juniper Treatment Alternative
This alternative includes the treatment of all western juniper trees except old growth and juniper growing in rocky outcroppings. Treatment of late stage encroachment would not provide timely benefits to sage-grouse because it would take several years for suitable habitat to develop. Treatment of late stage encroachment also requires more intensive management actions with greater likelihood of impacts to resources. Recent research identifies that the most beneficial juniper treatments for sage-grouse and ecosystem function are derived from targeting early stage encroachment (Bates et al. 2011; Pyke 2011; Baruch-Mordo et al. 2013; Bates et al. 2013; Miller et al. 2013; Miller et al. 2014a; Roundy et al. 2014a; and Roundy et al. 2014b). Targeting early stage encroachment is less costly and in most cases, provides immediate benefits to sage-grouse.

Targeted Treatment: Very Young and Small Tree Alternative
It was suggested during scoping that BLM should include an alternative that targets removal of only very young and small trees. This alternative was considered but not analyzed further because most areas of encroachment consist of various ages and sizes of juniper. The stage of encroachment is based on the percent canopy cover of trees in sagebrush steppe habitat rather than the size or age of trees. Removing only very young and small trees growing in areas with older and bigger trees provides little to no benefit to sage-grouse habitat because the remaining trees would continue to reduce sagebrush steppe vegetation and provide perches and nest sites for aerial predators including raptors, ravens, crows, and magpies. Removing only very young/small juniper would leave several hundred-of-thousands of acres of sage-grouse habitat as marginal or unsuitable, and in a downward trend. This alternative would not meet the objective of a treatment that would not provide long-term benefits to sage-grouse.

Restrict Treatments to Sage-grouse Habitat Outside of Grazing Allotments Alternative
This suggested alternative is to restore sage-grouse habitat outside of grazing allotments using selective hand cutting of younger trees in the vicinity of sage grouse leks and important use areas. There are roughly 50,000 acres in the far southwest corner of the project area boundary

that are not part of any grazing allotment, and only three of those acres are within a focal treatment area (i.e., meet the criteria for juniper removal treatment). This proposal has some similarities to what the BLM is proposing: hand cutting younger trees near leks and important sage-grouse use areas, and leaving felled trees on site to provide maximum watershed protection and promote recovery of native vegetation; however, it does not the meet purpose of and need for juniper removal in the project area to maintain and improve sage-grouse habitat at a large scale.

Livestock Grazing Management to Restore Habitat Alternative

Numerous commenters requested additional management activities focused on livestock grazing. Proposals were received ranging from closing the entire area to livestock grazing to reducing or eliminating grazing when it was shown to be a causal factor in sage-grouse habitat degradation. As the purpose of this project is to reduce juniper encroachment by targeting stands of juniper within the encroachment threshold, modifications to grazing management are outside the scope of this analysis. A no grazing alternative (Alternative C) and reductions in livestock grazing (Alternative E) were previously analyzed in the 2015 Idaho and Southwestern Montana Sub-regional Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) Final EIS. As such, changes, reductions or eliminations to livestock grazing within the project area were not carried forward for detailed analysis. Changes to grazing would not be required to meet the objectives of the project.

Designate Areas of Critical Environmental Concern (ACEC) Alternative

WildLands Defense (WLD) requested the designation of an ACEC or series of ACEC in the proposed project area as part of this NEPA process (EIS). WLD indicated the need for more ACEC-level management in the area. Currently there are nine ACEC within or spanning the project area boundary totaling approximately 219,000 acres (see Section 3.10) plus several others in the vicinity. Designation of ACEC can only occur during BLM's land use planning process or via land use plan amendment and is, therefore, outside of the scope of this EIS.

3.0 Affected Environment and Environmental Consequences

This section provides an evaluation of the baseline condition of the environment (i.e., resources identified during internal and external scoping as requiring analysis) potentially affected by implementation of the alternatives. The evaluation is a description of the current condition (affected environment) of identified resources and consequences or effects expected from implementing each alternative (environmental consequences). Direct and indirect impacts of the proposed actions will be discussed for BLM-administered lands.

Impact Descriptors

Effects can be temporary (short-term) or long lasting/permanent (long-term). These terms may vary somewhat depending on the resource; therefore, each will be quantified by resource where applicable. Generally speaking:

- ***Short-term*** effects are changes to the environment during and following ground-disturbing activities that revert to pre-disturbance conditions, or nearly so, immediately to within a few years following the disturbance.
- ***Long-term*** effects are those that would remain beyond short-term ground disturbing activities.

The magnitude of potential effects is described as being major, moderate, minor, negligible, or no effect and is interpreted as follows:

- ***Major*** effects have the potential to cause substantial change or stress to an environmental resource or resource use. Effects generally would be long-term and/or extend over a wide area.
- ***Moderate*** effects are apparent and/or would be detectable by casual observers, ranging from insubstantial to substantial. Potential changes to or effects on the resource or resource use would generally be localized and short-term.
- ***Minor*** effects could be slight but detectable and/or would result in small but measurable changes to an environmental resource or resource use.
- ***Negligible*** effects have the potential to cause an immeasurable and/or insignificant change or stress to an environmental resource or use.
- ***No effect*** means an action would produce no discernable effect.

Assumptions

Project Area

All project overview and resource maps (affected environments/resource analyses) depict the Alternative C1 (preferred alternative) project area, except for Map 2 and Map 3, because it is the larger footprint and encompasses alternatives B and C. Maps 2 and 3 are exclusive to alternatives B and C, respectively.

Cumulative Impacts

Analyses of cumulative impacts and the scope for each resource are also presented. Cumulative effects describe impacts of the alternatives when added with other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). It is difficult to quantify effects across the landscape as much of the cumulative actions and effects are reasonably speculative and somewhat immeasurable at this point. However, cumulative impacts for these other actions are discussed for all ownerships using the best available data in the cumulative impacts analysis area (CIAA) identified for each resource. Cumulative actions impact resources differently (to different degrees and/or extents). Some of these actions may have no impact on a particular resource; only cumulative actions having a potential effect on a resource are presented in the analyses for a given resource. In general, cumulative actions that have occurred in the vicinity and are likely to continue into the foreseeable future are as follows.

Wildfires

Fire history data in the project area indicate about 328,000 acres have burned at least once in the past 25 years (between 1991 and 2015); however, only 22,000 acres (7%) of these involved juniper. The 2007 Tongue Complex, for example, burned approximately 26,000 acres and the 2012 Jacks Fire burned approximately 43,000 acres of the project area. More recently, the 2015 Soda Fire burned roughly 182,000 acres of the project area. Future wildfires in the project area would not affect the acres of juniper treatment, but may influence the methods used for treatment.

Livestock Grazing

There are 143 allotments permitted for livestock grazing in the proposed project area. Livestock grazing is expected to continue into the foreseeable future. Allotted use levels may change in the future based on rangeland conditions and application of the Idaho Standards for Rangeland Health (Standards) and Guidelines for Livestock Management (Guidelines). The BLM requires that rangelands permitted for livestock grazing must meet or make significant progress toward meeting the Standards and Guidelines. Any changes to grazing management would be made through the permit renewal process per Title 43 of the Code of Federal Regulations (CFR), Part 4100, Subpart 4130.

Mining

Historical mining mainly occurred in the Silver City area but small mines are scattered throughout the area. There are approximately 9,785 acres within and adjacent to the project area with mining activity. Approximately 9,151 of those acres are part of the Kinross Delamar Mine located west of Silver City. This mine is in the process of rehabilitation and the only action occurring at the mine is reclamation. The Idaho Department of Lands also administers active mineral leases in the project area on state lands.

Exurban Development

Development for energy, agriculture, housing, etc., is expected to continue within the project area, most of which would occur along the Owyhee Front, which is the area south of the Snake River to the base of the Owyhee Mountains.

Fuel Breaks

The Bruneau Fuel Breaks Project is currently being implemented in the Bruneau Field Office. It includes mowing roadside shrubs and seeding approximately 85 kilometers (53 miles) of seeded fuel breaks along approximately 148 kilometer (92 miles) of roads. Mowed strips are 15-meters (50-feet) wide on each side of a road or 30-meters (100-feet) wide on one side of a road. Seeded fuel breaks would be up to 46-meters (150-feet) wide on each side of a road or 91-meters (300-feet) wide on one side of a road.

The Soda Fuel Breaks Project is in progress as of May 2017. Approximately 271 miles of fuel breaks (219 miles in Idaho and 52 miles in Oregon) along roads in and adjacent to the 2015 Soda fire perimeter will ultimately be developed and maintained. Fuel breaks will be created and maintained to maximum width of 60 meters (200 feet) to each side of roadways using the methods most suitable to a given site. Methods include mowing, hand thinning, targeted grazing, herbicide application, and seeding.

The proposed Tri-state Fuel Breaks Project would create a network of fuel breaks in southwest Idaho and eastern Oregon, connecting to existing fuel breaks developed by BLM Elko and Winnemucca, Nevada districts. An EIS is being prepared collaboratively with Idaho’s Boise District and Oregon’s Vale District. The BLM is proposing development of several hundred miles (to be determined) of fuel breaks within a 3.5 million-acre area along established roads using various methods.

Juniper Treatments
Pole Creek and Trout Springs juniper treatments are located on Juniper Mountain in southwest Owyhee County. The Pole Creek project is to be implemented over a 10-year period to maintain and restore existing sagebrush steppe, aspen, and riparian vegetation communities. Two types of treatment will be utilized; hand cut/girdle followed by broadcast burning and hand cut/girdle followed by jackpot burning. The Pole Creek treatment area encompasses approximately 21,000 acres and treatments include 5,500-7,700 acres of broadcast burning; 4,950-6,930 acres of jackpot burning, and juniper will be cut and left (scattered) on the remaining acres. Approximately 11,250 acres of the Pole Creek Project have been completed at this time. There are approximately 10,000 acres of the Pole Creek Project and the BOSH Project that overlap. The BOSH treatments would occur in the overlap area if there are juniper trees remaining that meet the criteria for treatment still present after the Pole Creek Project has been completed. Treatments for Trout Springs (23,000 acres) include 19,500 acres of broadcast burning and 3,800 acres of jackpot burning.

South Mountain (730 acres) is a research project being implemented in Owyhee County by the Agricultural Research Service (ARS) to study the hydrologic impacts of juniper removal from areas with well-established stands of juniper. Treatments include cutting followed by broadcast burning. The BLM anticipates the project to be completed by fall of 2018 or 2019 depending on funding. The South Mountain project area is outside but within one mile of the BOSH project area boundary. The Agricultural Research Service is currently studying the effects to hydrology by removing juniper in and near the BOSH project area on private lands; however, it is not known at this time when the studies will be completed. These projects consist of cut and scatter and mastication of juniper. Juniper treatment on private land is expected to continue for several years.

Within the BOSH project area, the Idaho Department of Lands is cutting juniper on State lands and several private land owners are also cutting and burning juniper.

Recreation
Dispersed recreation includes activities such as off-highway vehicle (OHV) use, camping, hunting, bird watching, hiking, backpacking, and sightseeing. Typically, OHV use is high on the trail system south of Murphy. The trail system is along the Owyhee Front and covers approximately 203,000 acres. Additionally, the area is host to several organized recreation events which include motorcycle events (races and fundraisers), mountain bike races, equestrian endurance rides and fundraisers, bird dog trials, and 4x4 fundraisers.

3.1 Soils

3.1.1 Affected Environment – Soils
Soils in the project area are diverse as a result of variability in parent materials, climate, and vegetative communities. A wide array of major landforms, soil characteristics, and ecological sites occurs in the project area and are summarized in Table 5. Soils information is derived from the Soil Survey of Owyhee County Area, Idaho (ID675) and from Soil Survey of Elmore County Area, Idaho, Parts of Elmore and Owyhee Counties and (ID685) (USDA NRCS 2015). More detail regarding major land forms and their soil characteristics is presented below.

Table 5 – Major Land Forms, General Soil Information, and Ecological Sites in the Focal Treatment Area[1].

Major Landform	General Soil Characteristics	Ecological Site(s)	% of Analysis Area
Pyroclastic flows	Well drained, ash influenced loamy/clayey, gravel/stones throughout; very shallow to very deep, derived from volcanic rock	Clayey Claypan Loamy Very Shallow Stony Loam	28
Volcanic domes	Well drained, ash influenced loamy, gravel/stones throughout, shallow to deep, derived from volcanic rock	Claypan Loamy Mahogany Savanna	18
Structural benches	Well drained loamy/clayey, gravel/stones throughout, shallow to very deep, derived from volcanic rock and mixed alluvium	Claypan Loamy Shallow Claypan	16
Hillslopes	Well drained loamy/clayey, gravel/stones throughout, very shallow to moderately deep, derived from volcanic rock	Claypan Loamy Shallow Claypan Very Shallow Stony Loam	15
Mountain slopes	Well drained loamy/clayey; gravel/stones throughout, shallow to moderately deep, derived from mixed alluvium/igneous/granodiorite	Claypan Loamy	12
Outwash terraces	Well drained loamy, gravel throughout, moderately deep to very deep, derived from volcanic rock/lacustrine	Claypan Loamy	2
Canyons	Well drained loamy, gravel/cobbles throughout, very deep, derived from volcanic rock	Loamy	1
Rock outcrop & Rubble land	Solid rock, coarse rock fragments	None (support no or very sparse vegetation)	8

[1]Due to the large number of soil map units composing the focal treatment area (more than 1,200), only soil complexes and associations made up of 10,000 acres or more were analyzed for this section (totaling approximately 378,000 acres); the remaining smaller map units have similar features to those addressed here, so the analysis area can be extrapolated to the extent of the focal treatment areas.

Pyroclastic Flows

Common soils are well drained loamy/clayey derived from volcanic rock with significant volcanic ash influence. They have various amounts and sizes of rock fragments throughout the profile and some soils have stones on the surface. They range in depth from very shallow to moderately deep to an indurated duripan or bedrock, while less than 2% are very deep. They are

correlated to Clayey, Claypan, Loamy, or Very Shallow Stony Loam ecological sites. These areas comprise approximately 106,000 acres or 28% of the area analyzed.

Volcanic Domes
Common soils are well drained loamy derived from volcanic rock with significant volcanic ash influence. They have various amounts and sizes of rock fragments throughout the profile and some soils have stones on the surface. They range in depth from shallow to deep to bedrock. They are correlated to Claypan, Loamy, or Mahogany Savanna ecological sites. These areas comprise approximately 68,000 acres or 18% of the area analyzed.

Structural Benches
Common soils are well drained loamy/clayey derived from volcanic rock with some volcanic ash influence or from mixed alluvium. They have various amounts and sizes of rock fragments throughout the profile and some soils have stones on the surface. They range in depth from shallow to moderately deep to an indurated duripan or bedrock, while approximately 10% are very deep. They are correlated to Claypan, Loamy, or Shallow Claypan ecological sites. These areas comprise approximately 60,000 acres or 16% of the area analyzed.

Hillslopes
Common soils are well drained loamy/clayey derived from volcanic rock. They have various amounts and sizes of rock fragments throughout the profile and some soils have stones on the surface. They range in depth from very shallow to moderately deep to bedrock. They are correlated to Claypan, Loamy, Shallow Claypan, or Very Shallow Stony Loam ecological sites. These areas comprise approximately 57,000 acres or 15% of the area analyzed.

Mountain Slopes
Common soils are well drained loamy/clayey derived from mixed alluvium, igneous rock, or granodiorite. They have various amounts and sizes of rock fragments throughout the profile and some soils have stones on the surface. They range in depth from shallow to moderately deep to bedrock. They are correlated to Claypan or Loamy ecological sites. These areas comprise approximately 45,000 acres or 12% of the area analyzed.

Outwash Terraces
Common soils are well drained loamy derived from volcanic rock or lacustrine deposits. They have various amounts and sizes of rock fragments throughout the profile. They range in depth from moderately deep to an indurated duripan to very deep. They are correlated to Claypan or Loamy ecological sites. These areas comprise approximately 8,000 acres or 2% of the area analyzed.

Canyons
Common soils are well drained loamy derived from volcanic rock. They have various amounts and sizes of rock fragments throughout the profile. They are very deep. They are correlated to a Loamy ecological site. These areas comprise approximately 4,000 acres or 1% of the area analyzed.

Bedrock & Rubble Land
These are scattered areas of bedrock and rubble land ranging in size from less than one acre to several acres. Bedrock consists of solid rock that is exposed at the surface. Rubble land consists of course angular rock fragments of any size lying at the base of a cliff or very steep rock slope. Gravity is the primary transport mechanism. These areas comprise approximately 30,000 acres or 8% of the area analyzed.

Erosion Potential

Water Erodibility
The soil erodibility factor (Kw) is used to quantify soil detachment by runoff and raindrop impact. The Kw applies to the whole soil, including rock fragments. For this analysis, it specifically refers to soil properties of the surface horizon. The lower the Kw value, the more resistant that soil is to erosion by water. Approximately 6% of soils within the project are not assigned and are not susceptible to erosion by water, 40% have a low susceptibility, 32% have a moderate susceptibility, and 4% have a high susceptibility (Table 6).

Table 6 – Potential for Erosion by Water.

Erosion Susceptibility	Kw Range	Portion of Project Area
None[1]	No Kw	6%
Low	0.02 to 0.19	40%
Moderate	0.20 to 0.40	40%
High	0.41 to 0.69	6%

[1] Soils in some map units (e.g., rock outcrops, rubbleland, and water) are not assigned a K factor. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by water.

Wind Erodibility
The wind erodibility group (WEG) is used to quantify the susceptibility of soil to blowing. Wind erodibility groups range from 1 through 8. The WEGs are based on properties of the soil surface horizon. The lower the WEG designation, the higher the susceptibility of that soil to wind erosion. Approximately 6% of the project area is not assigned to a WEG and is not susceptible to wind erosion; these are the same soils also not assigned a Kw value. Approximately 7% of soils within the project area have a low susceptibility to wind erosion, 83% have a moderate susceptibility, and 4% have a high susceptibility (Table 7).

Table 7 – Potential for Erosion by Wind.

Erosion Susceptibility	WEG	Portion of Project Area
None[1]	Not assigned	6%
Low	8	7%
Moderate	3-7	83%
High	2-1	4%

[1] Soils in some map units (e.g., rock outcrops, rubbleland, and water) are not assigned to a WEG. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by wind.

Other Soil Properties

Biological Soil Crusts

Biological soil crusts are an important component of many ecological sites in the project area. They function as living mulch by retaining soil moisture and discouraging annual weed growth. They reduce wind and water erosion, fix atmospheric nitrogen, and contribute to soil organic matter (USDI BLM and USGS 2001). Biological soil crusts also protect interspatial surface areas from various forms of erosion. By occupying the area between larger plants, these crusts enhance soil stability, soil moisture retention, and site fertility (by fixing atmospheric nitrogen and contributing organic matter).

Lichens and mosses are the most common biological soil crusts in southwest Idaho, and therefore, the project area. These crusts are less likely to occur in sites that have experienced successive disturbance legacies (e.g., roadsides). Biological soil crusts are also more prevalent at lower elevations compared to higher elevations with greater precipitation where vascular plant growth precludes biological crust development (USDI BLM and USGS 2001).

Organic Matter

Organic matter is namely comprised of decomposed plant residue. It increases water holding capacity, helps retain soil moisture, aggregates soil providing structure and stability, increases porosity and water infiltration, and provides nutrients by releasing phosphorus, nitrogen, and sulfur into the soil. Organic matter content ranges from less than 1% to about 3% across the project area; although, organic matter content can range up to 6% for some moderate or somewhat poorly drained soils occurring on stream terraces or in drainages.

3.1.2 Environmental Consequences – Soils

Soil characteristics of the dominant soil component for each map unit was used to determine the effects under each alternative analysis.

Impacts of Juniper Encroachment

Junipers compete for available water and nutrients in the soil and out-compete other native species. As the juniper canopy increases, shrubs and herbaceous vegetation are suppressed and die off, and the amount of bare and exposed soils increases. As a result, soil organic matter decreases which affects soil structure and stability. Soil erosion increases in intensity from rain impacts in early stage encroachment to concentrated flows in the later stages of encroachment (Miller et al. 2014a and b).

Impacts Common to Action Alternatives

The extent of adverse impacts to soils would depend on the amount and type of disturbance associated with a particular activity, as well as the erosion risk of a given area. As slopes become steeper, the risk of soil instability increases, particularly for soils that are susceptible to wind and/or water erosion (low WEG or high Kw values, respectively). Actions that alter plant cover and composition (amount and species), other ground cover (biological soil crusts, litter, and surface stones), soil structure, and permeability (e.g., compaction, water repellency, etc.) may increase erosion potential.

Direct impacts from soil disturbing activities during juniper treatments include mixing and breaking down soil components, compaction, and removal of soils in the short term (0-3 years) and long term (10+ years). Compaction alters soil structure (e.g., reduced porosity, increased

bulk density) and, therefore, affects its ability to support healthy vegetation communities and to properly cycle water and nutrients over the long term (USDA USFS 2006). Indirect impacts to soils include removal of ground cover (e.g., vegetation, biological soil crusts, and litter) in the short term, thus exposing the soil surface to wind and water erosion and colonization by weedy, invasive, disturbance related vegetation (e.g., cheatgrass) and/or noxious weeds (e.g., leafy spurge).

Research has shown that juniper removal improves water infiltration and reduces soil erosion on woodland-encroached sites over the long term, even in sites dominated by juniper (>27% average juniper canopy cover – late phase II/early phase III) where shrubs had been eliminated from the site (Pierson et al. 2007 and 2013). Pierson et al. (2007) found that tree cutting increased intercanopy herbaceous cover within 10 years and that the enhanced intercanopy vegetation and ground cover resulted in negligible intercanopy runoff and erosion from simulated high intensity rainfall. In contrast, the bare intercanopy in uncut woodlands yielded high rates of soil loss from simulated rainfall (Pierson et al. 2007).

Cut and leave

Cut and leave techniques would be carried out on approximately 86-87% of the focal treatment areas. Treatments would be accomplished using hand tools which would limit soil disturbance. Leaving and/or scattering material (branches, boughs, etc.) would further minimize soil exposure and help to stabilize disturbed soil surface. Moreover, this treatment would occur in phase I juniper (i.e., >0-10% canopy cover), where juniper are widely spaced.
Overland OHV travel to transport sawyers to remote locations has the potential to compress biological soil crusts; however, only single passes would be permitted (Methods section 2.2.4). Overall impacts to biological soil crusts, and soils in general, would be negligible.

Mastication

Mastication is proposed on up to approximately 1% of the treatment area. Heavy machinery could produce direct impacts to soils increasing erosion risk where soils are disturbed. Direct impacts include damage to soil structure (e.g., mixing or compaction), removal of top soil, and damage to or removal of biological soils crusts. However, mastication would take place along roadsides where biological soil crusts are likely not a major component of the soil due to the disturbance regime associated with roads and road maintenance. Mastication would be done on a limited basis and be limited to roadsides within a 60-meter (200-foot) buffer, and wood chips created from mastication would offset this disturbance by limiting erosion. Decomposing wood chips may tie up nitrogen in the top 5mm of the soil over the short term; however, decomposed wood chips would increase soil organic matter over the long term.

Jackpot and Pile Burning

Jackpot or pile burning on approximately 12-13% of the treatment area could produce direct impacts to soils depending on fire intensity. Jackpot and pile burning would cause short-term loss of herbaceous material, damage biological soil crusts, and remove woody plant material. This would expose soil making it susceptible to surface erosion, runoff, and sediment production as well as increase the potential for weed infestation. Fire could reduce the diversity and richness of biological soil crusts (Hilty et al 2004) and increase water repellency (hydrophobicity) of soil resulting from moderate or high fire severity (Glenn and Finley 2009).

However, fire severity for jackpot burning is expected to be low; fire severity for pile burning could be moderate to high, but would be confined to small, localized areas (i.e., piles). Burning when soils are moist, frozen or snow covered per best management practices (section 2.2.4, Methods) would limit direct impacts to soils (e.g., loss of herbaceous plant cover, damage to biological soil crusts, combustion of soil organic matter, and creation of water repellent soils). Indirect impacts include erosion by wind and water in bare areas until re-vegetation occurs within one to a few growing seasons. Broadcast seeding or seedling planting, where warranted, and monitoring for and treatment of noxious weeds would facilitate vegetation recovery and reduce/control weed spread (section 2.2.5, Design Features).

3.1.2.1 Alternative A – No Action

There would be no direct effect to soils. Indirect effects to soils from continued expansion of juniper would include increased soil erosion and decreased soil quality by reducing soil moisture and organic matter over the long term. Soil organic matter would continue to decline as juniper continue to encroach sagebrush communities. Water infiltration would decrease resulting in increased sheet erosion and rill formation. Sedimentation would increase as surface water run off increases in amount and intensity, and soil moisture would decline with the lack of infiltration. Further, as juniper woodlands develop, resistance and resilience of the landscape decreases due to the loss of shrub steppe vegetation, making the soils more susceptible to erosion in the event of catastrophic wildfire.

3.1.2.2 Alternative B – Treatment Including Wilderness

Treatment of juniper would generally cause minor short-term disturbance to soils across approximately 684,000 acres (focal treatment area). Design features (section 2.2.5) and best management practices incorporated in methods (section 2.2.4) would limit adverse impacts to soils. In general, well drained soils would be at lower risk of erosion and compaction than poorly drained, saturated soils. Soil exposure (and therefore erosion) would be minimized where juniper materials are left in place or scattered on the soil surface. Long-term benefits to soils including increasing sagebrush and herbaceous perennial plant cover, improving soil structure, and reducing erosion risk would be greater than Alternative A (no treatment), slightly greater than Alternative C (as 31,000 more acres would be treated) and slightly less than Alternative C1 (as 42,000 fewer acres would be treated) by implementing this alternative.

Lopping trees and scattering material (or cutting and leaving trees in situ) would produce negligible short-term soil disturbance. Over the long term, soils with a high content of silt or very fine sand and impervious soil layers would experience less erosion compared to the no action alternative due to an increase in soil surface litter expected with lopping and scattering.

The greatest disturbance to soils (e.g., damage to or loss of biotic cover, compaction, mixing) is anticipated from use of heavy machinery where mastication occurs. Impacts to soils would be limited to the mastication buffer (60 meters/200 feet to either side of designated roads). Erosion potential would be minimized by scattering wood chips onto the soil surface. Chips created from mastication would offset adverse impacts by reducing erosion in the short term and increasing soil organic matter over the long term.

The BLM anticipates direct impacts to soils from burning to be minor because jackpot and pile burning would take place when soils are least vulnerable; erosion risk would be short-term and dissipate as vegetation repopulates these areas. An increase in soil erosion potential is expected where pile burning occurs on slopes, but would be limited to the area within and immediately surrounding the piled area.

Risk of Erosion by Water

The majority of treatments (54%) are proposed in areas that have a low susceptibility to water erosion (Table 8). Approximately 52% of the cut and leave treatment, 80% jackpot or pile burning, and 72% of treatments within 200 feet of roads are expected to occur in areas with no or low potential for erosion by water (None and Low categories combined). Of the treatments proposed in soils with moderate susceptibly to water erosion, 45% are cut and leave, 20% are jackpot or pile burning, and 26% of treatments are various within 200 feet of roads. Because the bulk of treatments are cut and leave treatments which are expected to produce only negligible adverse impacts to soils, soil erosion from water is not a concern overall, particularly since most of the soils are at low risk from water erosion (low Kw).

Table 8 – Alternative B: Potential for erosion by water.

Potential for Erosion by Water (Kw)	Cut and leave treatment acres (%)	Jackpot or pile burn treatment acres	Various within 200 feet of roads acres	Total acres (% focal treatment area
None[1]	26,400 (4%)	5,200 (7%)	180 (3%)	31,780 (5%)
Low	272,800 (46%)	57,700 (73%)	4,800 (69%)	335,300 (49%)
Moderate	267,100 (45%)	15,700 (20%)	1,800 (26%)	284,600 (42%)
High	31,600 (5%)	450 (<1%)	130 (2%)	32,180 (5%)

[1]Soils in some map units (e.g., rock outcrops, rubbleland, or water) are not assigned a K factor. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by water.

Overall, water infiltration would increase in the short term and long term where herbaceous plants and shrubs recolonize areas previously occupied by juniper, in turn reducing sheet and rill erosion and sedimentation. A decrease in juniper canopy cover would increase soil water availability over the long term (McIver et al. 2014). Removal of juniper, particularly in the early phases of encroachment, would reduce soil erosion and increase soil quality over the long term by increasing water infiltration, soil organic matter, and litter on the soil surface.

Risk of Erosion by Wind

The vast majority (82%) of treatments are proposed in areas in the moderate category for wind erosion potential (Table 9). Approximately 11% of the cut and leave, 22% of the jackpot or pile burn, and 17% of treatments within 200 feet of the road would occur in areas with no or low potential for erosion by wind (None and Low categories combined). Approximately 83% of cut and leave, 77% or jackpot or pile burn, and 1% of treatments within 200 feet of roads are expected to occur in areas with a moderate potential for erosion by wind. While approximately 6% cut and leave, 1% jackpot or pile burning, and less than 1% treatments within 200 feet of roads are expected to occur in areas with a high potential for erosion by wind. Similar to water erosion risk, the bulk of treatments are cut and leave treatments, which are expected to produce only negligible adverse impacts to soils; therefore, soil erosion from wind is of little concern overall, even though most of the soils fall within the moderate WEG.

Table 9 – Alternative B: Potential for erosion by wind per treatment type.

Potential for Erosion by Wind (WEG)	Cut and leave treatment acres (%)	Jackpot or pile burn treatment acres (%)	Various within 200 feet of road acres (%)	Total acres (% of Focal Treatment Area)
None[1]	26,400 (4%)	5,200 (7%)	180 (3%)	31,800 (5%)
Low	53,000 (9%)	12,200 (15%)	1,000 (14%)	66,200 (10%)
Moderate	494,400 (83%)	61,100 (77%)	5,800 (82%)	561,300 (82%)
High	23,900 (4%)	600 (1%)	50 (1%)	24,500 (3%)

[1] Soils in some map units (e.g., rock outcrops, rubbleland, and water) are not assigned to a WEG. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by wind.

3.1.2.3 Alternative C – No Treatment in Wilderness

Impacts to soils would be similar to Alternative B in the treatment areas (653,000 acres). Overall magnitude of adverse impacts would be less than the other action alternatives. Long-term soil benefits would be slightly less than Alternative B (as 31,000 fewer acres would be treated), less than Alternative C1 (as 73,000 fewer acres would be treated), and more than Alternative A (no treatment). The risk of soil erosion by water and wind (Table 10 and Table 11) would be nearly identical to Alternative B. The environmental consequences to untreated wilderness (31,000 acres) would be the same as described for Alternative A.

Table 10 – Alternative C: Potential for erosion by water per treatment type.

Potential for Erosion by Water (Kw)	Cut and leave treatment acres	Jackpot or pile burn treatment acres	Treatment within 200 feet of roads (ac)	Total acres (% of Focal Treatment Area
None[1]	22,600 (4%)	5,200 (7%)	180 (3%)	28,000 (4%)
Low	267,000 (47%)	57,700 (73%)	4,800 (70%)	329,500 (51%)
Moderate	245,900 (43%)	15,700 (20%)	1,800 (26%)	263,400 (40%)
High	31,300 (6%)	450 (<1%)	130 (2%)s	31,900 (5%)

[1]Soils in some soil map units (e.g., rock outcrops, gravel pits, rubbleland, and water) are not assigned a K factor, so the total acres in the table (387,500 acres) are lower than the focal treatment area acres.

Table 11 – Alternative C: Potential for erosion by wind per treatment type.

Potential for Erosion by Wind (WEG)	Cut and leave treatment acres	Jackpot or pile burn treatment acres	Treatment within 200 feet of road (ac)	Total acres (% of Focal Treatment Area
None[1]	22,600 (4%)	5,200 (7%)	180 (3%)	28,000 (4%)
Low	51,200 (9%)	12,200 (15%)	1,000 (14%)	64,400 (10%)
Moderate	469,600 (83%)	61,100 (77%)	5,800 (82%)	536,500 (82%)
High	23,200 (4%)	600 (1%)	50 (1%)	23,900 (4%)

[1] Soils in some map units (e.g., rock outcrops, rubbleland, and water) are not assigned to a WEG. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by wind.

3.1.2.4 Alternative C1 – Preferred Alternative

The environmental consequences (both positive and adverse) for this alternative (726,000 acres) would be greater than described in Alternative B. The risk of soil erosion by water and wind (

Table 12 and Table 13) would be similar to Alternative B and Alternative C. Overall magnitude of short-term, adverse impacts would be moderately higher than alternatives B and C, particularly regarding jackpot or pile burning in the interior, because impacts would occur over a larger area (96,000 acres versus 79,000 acres of burning, respectively). Impacts to soils from cut and leave treatments would be nearly identical to Alternative B; although 19,000 more acres of cut and leave treatments would be implemented under this scenario than for Alternative B, impacts would be minor at most. Design features developed to protect soils and other resources would limit adverse soil impacts (section 2.2.5). The long-term benefits to soils would be greatest with implementation of this alternative.

Table 12 – Alternative C1: Potential for erosion by water per treatment type.

Potential for Erosion by Water (Kw)	Cut and leave treatment acres	Jackpot or pile burn treatment acres	Treatment within 200 feet of roads (ac)	Total acres (% of Focal Treatment Area
None[1]	24,500 (4%)	5,700 (6%)	200 (3%)	30,400 (5%)
Low	311,700 (50%)	70,500 (73%)	5,400 (69%)	387,600 (59%)
Moderate	253,900 (41%)	19,500 (20%)	2,100 (27%)	275,500 (42%)
High	31,500 (5%)	470 (1%)	140 (2%)	321,100 (5%)

[1]Soils in some soil map units (e.g., rock outcrops, gravel pits, rubbleland, and water) are not assigned a K factor, so the total acres in the table (387,500 acres) are lower than the focal treatment area acres.

Table 13 – Alternative C1: Potential for erosion by wind per treatment type.

Potential for Erosion by Wind (WEG)	Cut and leave treatment acres	Jackpot or pile burn treatment acres	Treatment within 200 feet of road (ac)	Total acres (% of Focal Treatment Area
None[1]	24,500 (4%)	5,700 (6%)	200 (3%)	30,400 (4%)
Low	59,000 (9%)	18,900 (15%)	1,200 (15%)	79,100 (11%)
Moderate	513,600 (83%)	71,000 (77%)	6,400 (82%)	591,100 (81%)
High	24,500 (4%)	600 (<1%)	50 (<1%)	25,200 (4%)

[1] Soils in some map units (e.g., rock outcrops, rubbleland, and water) are not assigned to a WEG. Soil surfaces in this category include cobbles, stones, boulders, and bedrock and are not susceptible to erosion by wind.

3.1.3 Cumulative Impacts – Soils

3.1.3.1 Scope of Analysis

The approximately 1.67 million-acre project area serves as the cumulative impact analysis area. The project area spans portions of six watersheds: Middle Snake-Succor, Jordan, Middle Owyhee, Upper Owyhee, Bruneau and South Fork Owyhee. The cumulative impact analysis area was chosen because direct effects to soils are mostly localized in nature and cumulative effects to soils due to other activities would also be localized. The temporal frame for cumulative impacts is defined by the continued presence of the effects of past actions and the anticipated longevity of reasonably foreseeable future actions. The proposed project is anticipated to take approximately 10 to 15 years to complete. Direct and indirect effects to soils would dissipate once the area has been treated. Re-vegetation to a later seral state (i.e., a mature plant community that includes recolonization by shrubs) and recolonization of early successional biological soil crusts (e.g., phycolichens, cyanolichens, and mosses) in areas where mastication, shearing and/or

jackpot burning have occurred would take 10 to 15 years, so the direct and indirect effects to soils would dissipate within 30 years of initial project implementation.

3.1.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Soil erosion in the project area occurs by wind and water and may indirectly affect adjacent areas through sediment deposition. The primary concerns are sheet and rill erosion, particularly on disturbed areas with steeper slopes or areas where the vegetative cover has been disturbed or removed. Past, present, and reasonably foreseeable future actions and events that could result in similar indirect impacts on a large scale include fire, livestock grazing, recreation (OHV, hunting, etc.), exurban development, and juniper treatments (refer to section 3.0 for a detailed description of these actions). The collective effect of past actions has contributed to the existing condition of soils described in the Affected Environment above (section 3.3.1).

Wildfire

Although the majority of the area analyzed is unburned, wildfire history indicates fire will continue to affect areas within the project area. Within the project area roughly 328,000 acres have burned at least once over the last 25 years (1991-2015). Impacts to soils from wildfire depend on fire severity, which is dictated by several factors including fuel type, fuel moisture, temperature, relative humidity and wind speed. Low or moderate severity fires may burn ground cover including litter and biological soil crusts, but the soil surface and subsurface (e.g., organic matter) remain largely intact; erosion by wind and water is a short-term threat until re-vegetation occurs within one to a few growing seasons (depending on precipitation levels and fire severity). High severity fires may result in hydrophobic (water repellent) soils, reducing soil organic matter and productivity, and exposing soils to erosion by wind and water over the long term.

Wildfire suppression operations (e.g., burnout of fuels) can also lead to the additional loss of sagebrush and fine fuels in the understory of earlier phase juniper, or in adjacent sagebrush cover types, exposing these areas to additional wind or water erosion. Fire suppression activities will vary temporally and spatially depending on annual fire severity and extent. Suppression related disturbances affecting soils are generally restricted to bulldozer constructed fire lines, or hand lines to a lesser extent, which also remove vegetation and expose soils to wind and water erosion. Soil compaction may occur from heavy machinery if soils are saturated or if multiple passes are made.

Livestock grazing

Livestock have the potential to damage soils via compaction and alteration or destruction of biological crusts, particularly where they tend to congregate. Livestock grazing can also alter vegetative species composition. Historic and recent grazing management in these allotments have contributed to overall soil condition which varies across the project area. Soils in areas where livestock tend to congregate (e.g., water sources, fence lines) or trail are more heavily disturbed (e.g., compacted) than areas where livestock are dispersed. The BLM requires that rangelands meet or make significant progress toward meeting rangeland health standards (e.g., Standard 1 – Watersheds) by adjusting the timing, frequency, intensity, and/or duration of grazing as part of the permitting process.

Recreation
Recreation activities can alter or destroy biological crusts, compact soil surfaces, and increasing gaps between vegetation. Areas with higher levels of OHV use, such as along the Owyhee Front, have greater levels of soil erosion than more remote areas of the project area. Trails, especially on steep slopes often concentrate overland flow leading to increased levels of erosion and trenching. Susceptibility to erosion would increase in these areas and can cause moderate effects. It is difficult to quantify the spatial and temporal extent of these uses as it is not known where or to what extent these activities occur in the project area.

Exurban Development
Pressure to subdivide or expand infrastructure (power lines etc.) is relatively low in the project area. However in areas where development does occur, such as on adjacent private lands, impacts to soil resources are the result of activities that expose the soil and increase exposure to wind and water erosion.

Fuel Breaks
Several fuel break projects are currently being planned and implemented. Fuel breaks disrupt fuel continuity by creating areas devoid of or greatly reduced levels of vegetation (i.e., fuels). Fuel breaks are designed to reduce fire intensity (i.e., flame lengths), slow the spread of fire, and provide firefighters an increased margin of safety to engage in suppression actions. Moderate direct effects are expected due to reducing organic matter and soil surface litter, increasing potential for compaction, and exposing soil to wind and water erosion.

Juniper Treatments
Juniper removal has resulted and would result in similar effects as those described for Alternative B, section 3.1.2.2 above. However, if treatments include removal of Phase III juniper, or methods such as chaining (on state or private lands), the magnitude of direct effects would be greater.

3.1.3.3 Alternative A – Cumulative Impacts

Past, present and foreseeable future actions within the project area are having and would continue to have minor to moderate impacts on soil resources including increased soil erosion, as well as decrease in soil moisture and organic matter. Minor to moderate sheet and rill erosion will continue and soil quality will continue to degrade. Wildfires could produce minor to major direct and indirect impacts to soils depending on their size and frequency. During years of high wildfire activity, the extent of exposed soils could dramatically increase. However, the extent and success of fuel breaks in facilitating fire suppression would lessen these impacts. Additionally, vegetation rehabilitation and weed treatments would benefit indirectly by improving vegetation community health. Sedimentation in surface water will continue to occur. Soil compaction would continue to occur in those areas of frequent use by livestock or vehicles, especially if use occurs on saturated soils. Grazing management and vegetation projects would also minimize the extent of these impacts. Without juniper removal in the project area, juniper density and canopy cover will increase eliminating the shrub and herbaceous understory over the long term. The lack of understory would, in turn, increase soil erosion in the project area. Over the long term, adverse cumulative impacts to soils would be greater than for alternatives B, C, or C1.

3.1.3.4 Alternative B – Cumulative Impacts

Cumulative impacts here would also be moderate, overall; but, again, could be greater depending upon future wildfire. Juniper treatment activities could produce minor additive adverse impacts in the CIAA. Design features to avoid sensitive resources and to stabilize soils following treatments as well as treatment design (e.g., strategic placement of cut trees near riparian areas and wood chips along roadsides) would minimize the potential for soil erosion. Additionally, juniper removal on 684,000 acres would produce a minor to moderate benefit soils over the long term compared to Alternative A.

3.1.3.5 Alternative C – Cumulative Impacts

Cumulative impacts for Alternative C would be nearly identical to Alternative B across the 653,000-acre treatment area. There would be little measurable difference between B and C regarding impacts to soils incurred from project implementation because juniper treatments proposed in wilderness under Alternative B would be accomplished on foot and with hand tools. However, the long-term benefits to soils would be slightly less than under Alternative B because 31,000 fewer acres (i.e., wilderness) would be treated under this alternative; soil impacts on these acres would be similar to Alternative A.

3.1.3.6 Alternative C1 – Cumulative Impacts

There would be a minor short-term increase in adverse cumulative impacts to soil resources from implementation Alternative C1 (726,000 acres of juniper treatments) compared to alternatives B and C. However, this alternative would produce moderate long-term benefits to soils (i.e., improve water infiltration and availability and reduce sheet and rill erosion) when considered with all additive impacts compared to Alternative A.

3.2 Vegetation

3.2.1 Affected Environment – Vegetation

Climate, weather, soils, and disturbance regimes influence vegetation within the project area. Under the historic disturbance regime, plant communities move through different phases within the reference state, which represent pre-settlement conditions described in ecological site descriptions (USDA NRCS 2015). Perturbations outside the historic disturbance regime may cause the plant community to cross a threshold to a different state which is usually considered to be irreversible without management intervention. Fire ecology plays an important role in vegetation dynamics and plant community composition. Fire suppression and other anthropogenic influences alter susceptible vegetative communities from grass, forb, and shrub communities to juniper dominated states with shallow rooted grasses and few shrubs.

The majority of the vegetative communities within the proposed focal treatment area have juniper in the early stages of encroachment (phase I and early phase II). Low sagebrush, Wyoming big sagebrush, and mountain big sagebrush communities with native (or seeded to a small degree) herbaceous understories are the main vegetative communities across the project area and focal treatment area. In areas that have been previously and/or repeatedly disturbed, cheatgrass and medusahead, non-native invasive annual grasses, and/or early seral plants are present.

Climate and Weather Influence

Climate in the project area is characterized by hot summers and cold, snowy winters with an average of approximately 14 inches of precipitation annually. Precipitation is typically lower at elevations below 1,372 meters (4,500 feet) and higher at elevations above 1,372 meters (4,500 feet), which influences the vegetation a given area will support. For example, Wyoming big sagebrush is common below 1,372 meters (4,500 feet) and mountain big sagebrush is common above 1,524 meters (5,000 feet) in the project area. The mean annual temperature for the area is 7.7ºC (45.9ºF) with an average 91 frost free days. Above normal precipitation in the spring (March-May) can increase the total annual production of vegetation and viable seed production within the plant communities. Late freezes, below normal precipitation, or temperatures (regardless of moisture quantity) can have an adverse impact on total plant production.

Ecological Sites (Soil Influence)

An ecological site includes specific soil and physical characteristics that differ from other land in its ability to produce a distinctive composition and quantity of vegetation, and in its ability to respond similarly to management actions and natural disturbances (NRCS 2015). Refer to section 3.1 for details regarding soils in the project area and their associated soil characteristics and ecological sites. This section reports the climax or reference state vegetation for the ecological sites in the analysis area; however, the vegetation communities will vary based on disturbance regimes resulting in alterations of vegetation community components (i.e., states in transition). Western juniper is not a component of the historic climax plant communities (or reference states) for the ecological sites mapped in the project area, except for Shallow Breaks which comprises 2% of the project area. However, juniper has encroached into many ecological sites in the project area where soils are deeper and more fertile. Juniper encroachment is likely due to lack of wildfire to limit its spread and nearby seed sources.

Clayey, Claypan, and Shallow Claypan Sites

Clayey, Claypan, and Shallow Claypan ecological sites comprise approximately 50% of the analysis area. The reference state is characterized by alkali sagebrush, low sagebrush, antelope bitterbrush, bluebunch wheatgrass, Thurber's needlegrass, Idaho fescue, bottlebrush squirreltail, arrowleaf balsamroot, tapertip hawksbeard, and phlox. Western juniper is not associated with these sites but has encroached into these areas due to lack of fire and a nearby seed source.

Loamy Sites

Loamy ecological sites comprise approximately 34% of the analysis area. These sites range from 11 to 22 inches of precipitation, but are dominantly in the 13 to 16 inch zone. The reference states in the lower precipitation zones are characterized by basin big sagebrush, mountain big sagebrush, antelope bitterbrush, bluebunch wheatgrass, Idaho fescue, tapertip hawksbeard and phlox. The reference states in the higher precipitation zones are characterized by mountain big sagebrush, antelope bitterbrush, mountain snowberry, serviceberry, mountain brome, bluebunch wheatgrass, Idaho fescue, and western needlegrass. Western juniper is not associated with a majority these sites but has encroached into these areas due to lack of fire and a nearby seed source.

Very Shallow Stony Loam Sites

Very Shallow Stony Loam ecological sites comprise approximately 4% of the analysis area. The reference states are characterized by low sagebrush, antelope bitterbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, buckwheat, and Phlox. Western juniper is not associated

with a majority these sites but has encroached into these areas due to lack of fire and a nearby seed source.

Mahogany Savanna Sites
Mahogany Savanna ecological sites comprise approximately 2% of the analysis area. The reference states are characterized by curl-leaf mountain mahogany, mountain big sagebrush, mountain snowberry, antelope bitterbrush, mountain brome, bluebunch wheatgrass, Idaho fescue, western needlegrass, and tapertip hawksbeard. Western juniper is not associated with a majority these sites but has encroached into these areas due to lack of fire and a nearby seed source.

Shallow Breaks
Shallow Breaks ecological sites make up approximately 2% of the analysis area. These sites occur on rock outcrops and associated very shallow soils where bedrock comes near the soil surface. The reference plant community is characterized by a western juniper overstory with a sparse understory of Idaho fescue and Thurber's needlegrass. As the natural climax species in these sites, juniper would not be treated/removed. Juniper readily encroaches surrounding sites of deeper, more fertile soils, but was historically kept in check by natural wildfires.

Rock outcrop, Rubbleland, and Badland
Rock outcrop and Rubble land comprise approximately 8% of the analysis area. Rock outcrop consists of solid rock that is exposed at the surface and rubble land consists of coarse angular rock fragments of any size lying at the base of a cliff or very steep rock slope. Badland soils are scattered throughout the entire project area. They are highly dissected areas on short, steep slopes and are highly susceptible to water erosion. None of these areas supports much vegetation; therefore, treatments are not likely to occur in any of these areas.

General Plant Cover Types

The general plant cover types in the proposed project area[5] are described in Table 14. Low Sage, Big Sage and Big Sage Mix, and Mountain Big Sage are the main cover types (>18%) totaling 64% of the project area (Map 6). Other common cover types (>6%) include Juniper, Bunchgrass, and Salt Desert Shrub. Together, these six cover types comprise 87% of the project area. Roughly 127,240 acres (77%) of the Juniper cover type also includes big sagebrush, and approximately 38,490 acres (23% of this cover type and 2% of the project area, overall) are shallow breaks where juniper is the natural climax species. Importantly, even though juniper is not included in the descriptions for the main cover types, it has encroached there and is present to varying degrees. Table 3 in the previous chapter indicates that approximately 87% of the proposed treatment areas have a juniper canopy cover of >0-10%, and juniper canopy cover in most of these areas is less than 1%; therefore, juniper are widely scattered across numerous cover types in numerous ecological sites.

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[5] The acres presented here represent the Alternative C1 project area because it is the larger footprint, and it encompasses alternatives B and C.

Table 14 – General Cover Types and Descriptions.

General Cover Type	Acres	% of Project Area	Description
Agriculture	20,994	1.3	Cultivated croplands
Aspen	9,783	0.6	Aspen stands
Big Sage and Big Sage Mix	348,093	20.9	Wyoming and basin big sagebrush with perennial and annual grasses forbs
Bitterbrush	4,528	0.3	Antelope bitterbrush with sagebrush, perennial and annual grasses and forbs
Bunchgrass	116,971	7.0	Perennial bunchgrasses w/ sagebrush, annual grasses, and perennial and annual forbs
Conifer	5,590	0.3	Douglas fir, subalpine fir, and/or Ponderosa pine w/ perennial grasses and occasional aspen
Exotic Annuals	46,395	2.8	Cheatgrass or other annual grass (e.g., medusahead) w/ introduced perennial grass
Greasewood	6,494	0.4	Greasewood flats and greasewood/big sagebrush mix w/ perennial and annual grasses and forbs
Juniper[1]	165,730	10.0	Juniper w/ big sagebrush and grasses and forbs; some shallow breaks/juniper woodland[1]
Low Sage	403,004	24.2	Low sagebrush w/ bunchgrasses and forbs; may include some big sagebrush and rabbitbrush
Mountain Big Sage	307,038	18.4	Mountain big sagebrush w/ perennial grasses, annual grasses, mountain shrubs and/or juniper
Mountain Shrub	55,485	3.3	Mountain mahogany, Ceanothus, and other shrubs (e.g., snowberry) w/ perennial grasses and forbs
Rabbitbrush	26,509	1.6	Green and grey rabbitbrush w/ perennial and annual grasses and forbs; usually includes some big sagebrush
Salt Desert Shrub	103,588	6.2	Shadscale and/or fourwing saltbush and other shrubs (e.g., spiny hopsage) w/ perennial and annual grasses and forbs
Seeding	1,168	0.1	Crested wheatgrass or similar seeded, introduced perennial grass; some sagebrush, rabbitbrush, annual grasses and forbs also present
Sparse Veg	11,291	0.7	Sparsely vegetated rocky areas/lava

General Cover Type	Acres	% of Project Area	Description
Stiff Sage	939	0.1	Stiff sagebrush w/ perennial and annual grasses and forbs
Urban	121	<0.1	Developed
Water	692	<0.1	Reservoirs, ponds, streams
Wet Meadow	30,231	1.8	Mesic areas supporting herbaceous, riparian plants (e.g., rushes and sedges)
Blank/NA	32	<0.1	Not assigned

Plant Community Resilience and Resistance

Resilience is a plant community's ability to regain its functional processes and components following a disturbance, and resistance is the capacity of a plant community to retain functional processes and components after a disturbance (Chambers et al. 2014). The ability of plant communities to be resilient to disturbance and resistant to annual grass invasion increases with moisture, productivity and elevation (Miller et al. 2014b, Chambers et al. 2014). Conversely, plant communities in lower elevation areas with lower annual precipitation tend to be less resilient to disturbance and less resistant to invasive annual plants; these areas commonly include cheatgrass or other invasive annual plants in the plant community.

Vegetation in the proposed focal treatment areas have been classified into High, Moderate, or Low resilience and resistance (R&R) categories (Table 15, Map 7). According to R&R modeling data (Chambers et al. 2014), plant communities in approximately 65% of the focal treatment areas in B and C and 67% in C1 are highly resilient to disturbance and resistant to invasive plants, and 14% are moderately resilient and resistant for all alternatives; these communities are mainly at or above 1,524 meters (5,000 feet). Approximately 21% of plant communities in B and C and 20% in C1 exhibit low resistance and resilience and are mainly below 1,524 meters (5,000 feet).

Table 15 – Resilience and Resistance (R&R) acres for focal treatment area vegetation.

Alternative	R&R category	Acres in focal treatment area[1]	Proportion of focal treatment area[2]
B	High	444,800	65%
	Moderate	97,600	14%
	Low	141,000	21%
C	High	421,700	65%
	Moderate	91,000	14%
	Low	139,600	21%
C1	High	483,800	67%
	Moderate	98,100	14%
	Low	143,300	20%

[1]There are approximately 600 acres (< 1% of each focal treatment area) of Wetland/Riparian vegetation identified in the resilience/resistance spatial data. These areas are not assigned a resistance/resilience value; however, riparian areas and wetlands tend to be resilient (recover quickly) due moisture availability.
[2]Percentages were rounded to the nearest 1.

3.2.2 Environmental Consequences – Vegetation

Impacts of Juniper Encroachment

As juniper density increases and the trees mature, canopy cover increases, restricting sunlight and rainfall to understory plants (shrubs, grasses, and forbs). Over the long term (10+ years), vigor and viability of understory plants is reduced; eventually mortality of the shrub and herbaceous understory occurs due to shading and the lack of available water. The loss of understory plants decreases plant community diversity, leaves these areas more susceptible to invasion by weedy species, and moves plant communities farther from reference state. The loss of diversity among native plant communities reduces, and eventually eliminates, seed sources necessary for natural recovery, limiting the potential for restoration after disturbance.

Although old growth juniper can occasionally have associated parasitic vascular and non-vascular plants occurring within its structure, such as mistletoe and lichens, encroaching juniper is not known to have additional plant associations which add diversity to sites. Since, studies have found a ten-fold increase in area covered by western juniper since post-settlement, the overall effect of juniper encroachment in the absence of treatment on the loss of biodiversity within sagebrush habitats may be immense (Miller 1999).

Impacts Common to Action Alternatives

Juniper treatments could directly impact vegetation by removing, damaging (i.e., breaking, trampling) non-target plants in the short term (0-3 years). When vegetation is removed and soil is exposed, early successional species colonize the site; invasive species may establish and spread if there is a seed source nearby degrading the overall condition of plant communities. Surface disturbing activities could also indirectly affect vegetation over the long term by disrupting seed banks and mixing, eroding, or compacting soils. Soil erosion would reduce the substrate available for plants and soil compaction could limit seed germination. Impacts to plants occurring after germination but prior to seed set could be particularly harmful as both current and future generations would be affected.

Methods (e.g., scattering of juniper materials), design features, and best management practices would minimize these risks (section 2.2.1). Over the long term, removal of juniper would allow shrubs and herbaceous vegetation to reoccupy these sites, thereby improving plant community composition, structure, and function. Miller et al. (2014a) found that after juniper removal treatments in juniper encroached sagebrush steppe, perennial herbaceous cover (tall grasses and forbs) and shrub cover increased above pre-treatment and control levels within one to three years. Williams et al. (2017) found that the higher the density of juniper treated using prescribed fire, the higher the density of cheatgrass following treatment in the first three years; however, tall perennial grasses also increased, and between three and six years post-treatment, the ratio of tall perennial grasses to cheatgrass had increased. Proposed juniper treatments would largely target earlier phase juniper, and late phase treatments would target areas in moderate to high R and R (section 2.2.1 Features Common to All Action Alternatives). Therefore, removal of encroaching juniper would promote big sagebrush and herbaceous perennial vegetation to

recolonize and recover in areas formerly occupied by juniper in the BOSH project area, improving sagebrush community diversity, conditions, and overall land health across the project area.

Cut and leave
This method of treatment would occur on 86-87% of the treatment area in areas where juniper canopy cover ranges from >0-10%. Lopping and scattering of juniper (or cutting and leaving juniper in situ) would be executed using hand tools producing negligible direct impacts to non-target plants occupying the juniper understory or interspaces (intercanopy). Juniper material (branches, boughs, etc.) left in place or scattered would cover and help stabilize exposed soils, improving soil productivity over the long term which would promote robust vegetation communities.

Mastication
Mastication could occur in roughly 1% of the treatment area. Heavy machinery could directly impact non-target vegetation in the short term by breaking or uprooting plants in the 60 meter/200-foot treatment buffer along road corridors (see Methods section 2.2.4). The extent to which vegetation is disturbed would dictate the magnitude of indirect impacts to vegetation (i.e., above and below-ground productivity) over the long term. Disturbance or damage to soils could also impact plant communities (e.g., by seed bank disruption). However, mastication would be done on a limited basis and be limited to roadsides within the designated buffer where vegetation is often previously disturbed by ongoing road maintenance, etc. These areas could serve as vectors for the spread of invasive and weedy species potentially impacting adjacent vegetation; however, design features specific to avoiding weed spread (section 2.2.5) would minimize this risk. Similar to cut and leave, materials created from mastication (wood chips) would reduce erosion and increase soil organic matter over the long term. Annual and perennial grass production would increase in areas where mastication takes place due to increased inorganic nitrogen available in the soil (Young et al. 2014).

Jackpot and Pile Burning
This method could occur on approximately 12% of the treatment area. Direct impacts of jackpot or pile burning include damage to or elimination of adjacent vegetation (shrubs, grasses, and forbs), depending on the intensity of the fire. Elevated levels of nitrogen present following fire and the reduction of shrubs, tall perennial grasses, and biological soil crusts provide opportunities for invasive annual plants (namely cheatgrass) to increase in abundance (Blank et al. 2007; Chambers et al. 2007, Miller et al. 2014a). There could be a flush of cheatgrass where vegetation is burned as a secondary impact if there is a seed source nearby. Conversely, burning can also produce a flush of beneficial native annuals where an extant seed bank is intact.

Methods and best management practices (e.g., juniper materials or piles would be dry, adjacent plants would largely be dormant), ambient temperature would be low, and soil moisture content would be high) and design features would limit or eliminate the risk of fire spreading outside the target area (pile or jackpot) and/or impacting vegetation other than the targeted fuels (dried juniper material and debris). Additionally, design features (section 2.2.5) to minimize the spread of weeds would mitigate some risk of prescribed fire impacts.

3.2.2.1 Alternative A – No Action

Vegetation in the focal treatment area or greater project area would not be directly affected by the proposed juniper treatments. Continued juniper expansion (increasing juniper density and canopy) would result in moderate to major indirect effects to vegetation including reduced plant production, health, vigor, and diversity over the long term. Without treatment, the project area would have reduced resistance and resilience to disturbance. As juniper woodlands establish, if a wildfire does occur there, the likelihood of catastrophic wildfire increases, making the area more susceptible to invasion by annual grasses.

3.2.2.2 Alternative B – Treatment Including Wilderness

Direct impacts as described above for the implementation of this alternative on approximately 684,000 acres (including 31,000 acres of wilderness) include trampling, breaking, and removing the grass and forb understory and shrub component, particularly in areas where heavy machinery (i.e., mastication w/in 200 feet of roads) or burning are used (1% and 13%, respectively, of the focal treatment area; see Table 3 in section 2.2.4). Overall, 65% of all treatments combined would occur within the high R&R category, 14% in the moderate category, and 21% in the low category (Table 15). The vast majority of treatments - approximately 62% of cut and leave, 87% of jackpot or pile burning, and 91% mastication - would be in areas with high R&R and would be resilient to disturbance and resistant to invasive plants (Table 16).

Table 16 – R&R category acres per treatment type for Alternative B.

R&R Category	Treatment Type		
	Cut and leave acres (% of treatment)	Jackpot/pile burn acres (% of treatment)	Various w/in 200 feet of roads acres[1] (% of treatment)
High	369,200 (62)	69,200 (87)	6,400 (91)
Moderate	88,750 (15)	8,400 (11)	450 (6)
Low	139,300 (23)	1,500 (2)	170 (3)

[1]Various treatments including mastication and/or pile burning within 200 feet of roads.

Direct impacts would be higher than Alternative A (no treatment) and greater to a minor extent than Alternative C (approximately 653,000 acres of juniper treatment). Methods and best management practices (e.g., mastication only occurring along designated roadways and jackpot burning only in designated areas and only under specific conditions) would minimize the amount of vegetation impacted across the treatment area (section 2.2.4). Impacts to vegetation would also be minimized in areas where design features are applied (e.g., avoidance buffers for cultural, wildlife, or special status plant resources, and reseeding where necessary) (section 2.2.5).

Jackpot burning would result in site-specific, minor to moderate effects depending on fire severity/intensity. Non-target vegetation may be damaged or consumed, potentially creating bare areas in the short term. These areas would be susceptible to weed invasion until vegetation recovery occurs, within one to a few growing seasons for early seral grasses and forbs and several years (5 to 10) for shrub species to begin to recolonize the area. Burning criteria described in Methods (section 2.2.4) would ensure that fire severity/intensity would be low which would limit damage to vegetation.

Mastication and/or pile burning could take place within 60 meters (200 feet) along designated roads to reduce fire hazard and would have a minor to major, short-term, site specific impact on vegetation. However, the vast majority of treatments resulting in the heaviest disturbance to vegetation (mastication and pile burning) would occur in high resistance and resilience areas and would be site specific; mastication would occur within 200 feet of roads and burning would be restricted to piles.

A reduction in juniper canopy cover would increase soil water availability and increase herbaceous cover in the long term (McIver et al 2014). Removal of juniper would reduce wildfire hazard, increase shrub and native, herbaceous perennial production, and increase the understory plant community. The majority of the proposed project area has a moderate to high resilience to change and resistance to weed invasions after a disturbance; therefore, the long-term impacts would be minimal. Implementation of this alternative would shift the vegetative community to more closely resemble the reference state over the long term. Recovery of native herbaceous plants and shrubs (i.e., sagebrush steppe habitat) would be greater than Alternative A (No Action), slightly greater than Alternative C, and less than Alternative C1.

The wilderness Minimum Requirements Decision Guide for Alternative B would ensure that juniper treatment methods employed in the wilderness areas would cause the least possible disturbance, so impacts to vegetative resources in wilderness areas would be negligible.

3.2.2.3 Alternative C – No Treatment in Wilderness

The environmental consequences here would be the same as described for Alternative A in the wilderness areas (31,000 acres). Impacts to vegetation would be similar to Alternative B in the treated areas (653,000 acres), but the overall magnitude of impacts would be slightly less than B, as fewer acres would be treated under this scenario. Long-term benefits to vegetation would also be slightly less than Alternative B because of the reduced treatment area, and greater than Alternative A (No Action).

Like Alternative B, the vast majority of treatments - approximately 61% of cut and leave, 87% of jackpot or pile burning, and 91% of treatments within 200 feet of roads (e.g., mastication) - would be in the high R&R category. These areas are expected to be resilient to disturbance and resistant to invasive plants (Table 17). Overall, 65% of all treatments combined would occur within the high R&R category, 14% in the moderate category, and 21% in the low category (Table 15). Therefore, the vast majority of treatments would occur in high R&R areas which are resilient to disturbance and resistant to invasive species.

Table 17 – R&R category acres per treatment type for Alternative C.

R&R Category	Treatment Type		
	Cut and leave acres (% of treatment)	Jackpot/pile burn acres (% of treatment)	Various w/in 200 feet of roads acres[1] (% of treatment)
High	346,100 (61)	69,200 (87)	6,400 (91)
Moderate	82,200 (15)	8,400 (11)	450 (6)
Low	137,900 (24)	1,500 (2)	170 (3)

3.2.2.4 Alternative C1 – Preferred Alternative

Under Alternative C1 (726,000 acres), adverse and favorable direct and indirect impacts would be very similar to Alternative B in non-wilderness (653,000 acres) and Alternative C (653,000 acres). No treatment in wilderness is proposed for this alternative, so impacts to wilderness in the project area would be identical to Alternative A. Impact magnitude would be highest in this scenario as 42,000 more acres than Alternative B and 73,000 more acres than Alternative C would be treated. Long-term benefits to sagebrush steppe habitat would be greater than alternatives B and C because encroaching juniper would be removed across a larger area, and substantially greater than Alternative A (No Action).

Very similar to alternatives B and C, the vast majority of treatments - approximately 63% of cut and leave, 87% of jackpot or pile burning, and 91% of treatments within 200 feet of roads (e.g., mastication) - would be in the high R&R category (Table 18). These areas are expected to be resilient to disturbance and resistant to invasive plants. Overall, 65% of all treatments combined would occur within the high R&R category, 14% in the moderate category, and 21% in the low category (Table 15).

Table 18 - R&R category acres per treatment type for Alternative C1.

R&R Category	Treatment Type		
	Cut and leave acres (% of treatment)	**Jackpot/pile burn acres (% of treatment)**	**Various w/in 200 feet of roads acres[1] (% of treatment)**
High	392,400 (63)	84,200 (87)	7,200 (91)
Moderate	87,200 (14)	10,400 (11)	510 (6)
Low	141,500 (23)	1,600 (2)	200 (3)

3.2.3 Cumulative Impacts – Vegetation

3.2.3.1 Scope of Analysis

The CIAA for vegetation encompasses the proposed project area totaling approximately 1.67 million acres. This area was selected because it contains similar ecological sites and plant community components, conditions are similar, and land uses are comparable. Direct effects to vegetation from the proposed project area are mostly localized in nature and cumulative effects to vegetation due to other activities would also be localized. The primary concern is loss of vegetation, particularly in areas with low resilience and resistance.

The temporal period for cumulative impacts is identical to that described in the soils section above (3.1.3.1). Direct and indirect effects to vegetation would dissipate once the area has been treated. The proposed action is expected to take 10-15 years to complete. Re-vegetation with early- to mid-seral species in areas where mastication and/or burning occur is expected to take 10 to 15 years. Therefore, the direct and indirect effects would dissipate within 30 years of initial project implementation; as a result cumulative effects will be considered through 2048.

3.2.3.1 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Past actions to be considered include livestock grazing, recreation (OHV use, hunting, etc.), exurban development, vegetation treatment and fire suppression activities. The collective effect of past actions has contributed to the existing condition of the vegetation described in the affected environment section 3.2.1.

Wildfire

Wildfire history indicates that fire will continue to affect areas within the project area. Several fires have influenced the vegetative communities in portions of the proposed project area including the 2007 Tongue Complex and 2012 Jacks fires, and most recently, the 2015 Soda Fire which burned nearly all of the vegetation in the fire perimeter with the exception of some small islands of sagebrush and portions of riparian areas. Monitoring information for the Crutcher Fire portion of the Tongue Complex documented that in areas with low to moderate fire severity the understory species were relatively undamaged and exhibited a high degree of recovery. Areas that burned more severely had heavy damage to perennial understory species and those areas were subsequently dominated by annual forbs and maintained fewer perennials. Monitoring information for the Jacks Fire noted good perennial grass vigor; perennial grasses have increased in size since 2013 and were producing seed heads. Overall site assessments indicated that the perennial grasses and forbs were recovering in both Tongue and Jacks fires.

Intense/severe fires can effectively reset vegetative communities from mature/late successional plant communities (e.g., shrubs and perennial grass dominated communities) to early seral plant communities (e.g., annual and perennial forb and grass dominated communities). Future wildfire suppression activities will vary temporally and spatially depending on annual fire severity and extent. Suppression related disturbances are generally restricted to bulldozer constructed fire lines (dozer lines). Both wildfire and suppression activities may increase the risk of invasive annual species spreading into vegetation communities. Species composition in areas burned by wildfire and in dozer lines will depend on the success of rehabilitation treatments and/or natural vegetation recovery following fire.

Livestock grazing

Permitted livestock grazing has the potential to affect vegetation by altering biomass and species composition across the entire project area. There are 143 grazing allotments within the BOSH project boundary. Current livestock grazing permits include grazing schedules along with terms and conditions to achieve or make significant progress toward meeting Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management. As public land grazing permits are renewed, the BLM is required to adjust management of allotments not currently meeting rangeland health standards by changing the timing, frequency, intensity, and/or duration of grazing.

Ongoing and future livestock grazing is projected to maintain or improve upland vegetation on the whole (i.e., continue to meet or make significant progress toward meeting Standards 1-8). However, livestock grazing will continue to result in plant community alterations in localized areas adjacent to fences, gates, and livestock facilities (e.g., troughs and supplement sites).

Livestock grazing is expected to continue at current levels into the foreseeable future unless changes are made as a result of permit renewal to address issues detected during that process.

Recreation
It is difficult to quantify the spatial and temporal extent of OHV use, camping, hunting, bird watching, hiking, backpacking and sightseeing. These activities can affect vegetation by harming individual plants, impacting communities and increasing gaps between vegetation. Susceptibility to weed invasion would increase in these areas and can cause moderate effects.

Exurban Development
Habitat fragmentation and pressure to subdivide are relatively low in the project area; however, in areas where it does occur, development can have moderate effects on vegetative resources by creating new construction sites and roads which removes vegetation and increase the potential for invasive weeds to establish.

Fuel Breaks
Several fuel break projects are currently being implemented and planned in an effort to create safe, defensible space for fire fighters. The Bruneau Fuel Breaks Project consists of vegetation alteration via 92 miles of mowing and 52 miles of seeding to create fuel breaks. The in progress Soda Fuel Breaks Project includes fuel break development along 271 miles of roads. This includes mowing, herbicide, and seeding treatments along 235 miles and targeted grazing along 36 miles of roads. The Tri-state Fuel Breaks Project is still in the planning phase. These projects include planting short-statured native and/or introduced species, or creating areas with greatly reduced vegetation (i.e., fuels) to improve access for fire suppression in and around the project areas. Moderate site-specific direct effects are expected due to removal of vegetation. Long-term indirect effects include increased potential for weed invasion; however, best management practices (BMPs), project design features and ongoing weed treatments is expected to offset these impacts.

Juniper Treatments
The Pole Creek and Trout Springs juniper treatments overlap the project area. Juniper removal that occurs in the project area will result in similar effects as those described under Alternative B, section 3.3.2.2 above. However, effects on private or state lands may be more severe if treatments include removal of juniper in late stages of encroachment or include methods such as chaining; private land owners are not required to follow BLM's (or other) BMPs, and BMPs may vary for projects on state lands. The Agricultural Research Service is currently studying the effects to hydrology by removing juniper in and near the BOSH project area on private lands; however, it is not known at this time when the studies will be completed.

Other Vegetation Treatments
Other vegetation treatments include ESR treatments in response to wildfire and ongoing weed treatments by the Boise District and cooperative weed management areas (CWMA) that fall within the analysis area (see section 3.4, Noxious Weeds, for more information). Vegetation rehabilitation efforts for the 2015 Soda Fire are ongoing and include large-scale drill and aerial seeding, seedling planting, and herbicide application. Noxious weed treatments include chemical, biological, and manual treatments. The extent to which these and other past and future

ESR and weed treatment efforts are successful will influence plant community condition across the analysis area

3.2.3.2 Alternative A – Cumulative Impacts

Past, present and foreseeable future actions within the project area are having and would continue to have minor to moderate impacts on some vegetative resources via disturbance of individual plants, decreasing productivity and moving plant communities away from the reference state, and conversely increasing productivity and improving plant communities via grazing management improvements and vegetation treatments (e.g., ESR and noxious weed treatments). Fewer juniper treatments would occur under Alternative A, resulting in sagebrush steppe plant communities being gradually replaced by juniper woodland communities on more acres over the long term. A corresponding change in fuel loads would also occur.

Impacts to vegetation from fire could be negligible to major depending on the size and intensity of future wildfires. Burned areas would be more susceptible to invasion by invasive annual grasses. However, some of the harm caused by wildfire could be minimized through ESR treatments followed up by extensive noxious weed treatments. These and other vegetation treatments would improve and restore vegetation communities within the CIAA to the extent that they are successful. Overall cumulative effects would be moderate and include loss of sagebrush steppe plant communities from continued juniper encroachment, wildfire, and invasive annual grasses. In the long term, the cumulative loss of sagebrush communities under Alternative A would be greater than under Alternative B or Alternative C.

3.2.3.3 Alternative B – Cumulative Impacts

Similar to Alternative A, past, present and foreseeable future actions within the project area are having and would continue to have minor moderate, adverse and beneficial impacts on vegetative resources. Alternative B would have minor short-term increases in negative impacts to the vegetative resources due to the implementation of juniper treatments when considered with other past, present and foreseeable future actions, namely where jackpot burning, pile burning, and mastication occur. Juniper removal on 684,000 acres would produce a minor to moderate benefit sagebrush communities over the long term compared to Alternative A by preventing conversion to juniper woodlands and reducing plant community diversity and condition.

3.2.3.1 Alternative C – Cumulative Impacts

Cumulative impacts for Alternative C would be nearly identical to Alternative B across the 653,000-acre treatment area. There would be little measurable difference between B and C regarding impacts to vegetation incurred from project implementation because juniper treatments proposed in wilderness under Alternative B would be accomplished on foot and with hand tools. However, the long-term benefits to sagebrush communities would be less than under Alternative B because 31,000 fewer acres (i.e., wilderness) would be treated under this alternative; impacts to vegetation on these acres would be similar to Alternative A.

3.2.3.2 Alternative C1 – Cumulative Impacts

There would be a minor short-term increase in adverse cumulative impacts to vegetation from implementation Alternative C1 (726,000 acres of juniper treatments) compared to alternatives B

and C. However, this alternative would produce moderate long-term benefits to sagebrush communities when considered with all additive impacts compared to Alternative A.

3.3 Special Status Plants

3.3.1 Affected Environment – Special Status Plants

Special status plants (SSP) include those species listed or proposed for listing under the Endangered Species Act (ESA) and species designated as sensitive by the BLM State Director. The BLM SSP are assigned a numeric ranking (Type 1 to 4) according to scarcity and risk of extinction as follows:

- Type 1 = Federally Threatened, Endangered, Proposed and Candidate Species
- Type 2 = Range-wide/Globally Imperiled Species – High Endangerment
- Type 3 = Range-wide/Globally Imperiled Species – Moderate Endangerment
- Type 4 = Species of Concern

The IDFG Natural Heritage Program maintains records for these sensitive species in terms of Elemental Occurrences (EO) and point and polygon data. An EO is a specific geographic location where a species or natural community is, or was, present. Populations of a species located greater than 1 kilometer (0.62 miles) apart are identified as separate EOs. For the purpose of this project, point and polygon data were grouped into occurrences and considered unique if separated by 1 kilometer or greater, and only SSP that met the following criteria[6] were considered for analysis:

- EO location precision was S (high precision location data) or M (good precision location data to within 1.25 miles); G (vague locality data) was not included
- Last observations (and reports) were within the past 30 years (≥1985)
- Location was within the Project Area and habitat could be associated with juniper, or location could be associated with treatment access (even though habitat not associated with juniper)

Special status plant species occur in a variety of plant communities and physical habitats. Many SSP inhabit distinctive soil types, and several species often occur together (Table 19 and Table 20). The general habitat types that support special status plants in the project area are lake-bed sediments, cindery soils, clay soils, sagebrush steppe, sandy soils, lithic soils, and wetland areas. Thirteen SSP species totaling 146 occurrences (or portions, thereof) are in the project area where juniper are present or are likely to encroach (Table 19, Maps 8 and 9). Fifteen SSP species totaling 112 occurrences (or portions, thereof) do not include juniper due to highly specific soil characteristics; however, occurrences are located along or near roads that could potentially be used as access routes for juniper treatments (Table 20, Maps 8 and 9).

[6]G is the lowest precision and is typically applied by the Idaho Fish and Game's Idaho Natural Heritage program to historic observations and/or observations lacking GPS data. A large buffer (e.g., 5 to 10-mile diameter) is created around a centroid, indicating that the location of the EO likely occurs/occurred somewhere within the polygon, but confidence is low as to its precise location. EOs with G precision and/or EOs where the most recent observation was before 1985 (≥30 years ago) are not included because the certainty of their presence is low. EOs ranked X (extirpated) are also not included.

Table 19 and Table 20 also present the range of estimated viability rankings for each SSP. Estimated viability is categorized by the IDFG Natural Heritage Program as follows: A = excellent; B = good; C = fair; D = poor; E = confirmed extant but population size, condition, and landscape context has not been assessed; and NA = viability not assessed. Occasionally, combinations of these are used to indicate the differences in rank specifications. For example, the condition of a population itself might be good (rank B), but the landscape context (e.g., overall plant community or habitat condition) might be fair (rank C); hence, an overall ranking of BC. Most of the occurrences have been rated in good condition. Excellent or good estimated viability correlates to healthy, often numerous plants and little or no disturbance or disturbance-related vegetation (e.g., cheatgrass and/or weedy annual forbs) in the surrounding plant community. Poor estimated viability, on the other hand, correlates to stressed, often few plants and heavy disturbance and/or disturbance-related vegetation.

The Soda Fire boundary contains 66 of the 186 occurrences in the project area. The 2015 Soda Fire Emergency Stabilization and Rehabilitation (ESR) Plan indicated that due the open, sandy or ash soils with low vegetative cover where these 66 EOs tend to occur, they were often unburned or burned at a lower intensity than the surrounding area vegetation. The ESR Plan also indicated that surrounding area vegetation (i.e., sagebrush and perennial grasses) experienced high mortality, overall. Although the estimated viability rankings presented in the tables below do not account for the Soda Fire, we can deduce that population conditions for the 66 occurrences are likely similar to conditions prior to the fire because they were relatively unharmed, but overall habitat conditions have degraded due to the high mortality of nearby vegetation (i.e., plant communities). Extensive treatments are underway to rehabilitate these and other habitats burned by the Soda Fire.

Table 19 – Special status plants potentially associated with western juniper in project area boundary.

Plant Name	Type #	Number of occurrences	Estimated Viability	General Habitat Characteristics
Bacigalupi’s downingia	4	12	AB-C	edges of wet meadows, vernal pools
barren milkvetch	3	5	B/BC	Ash outcrops on bluffs, knolls, and slopes in sagebrush and bitterbrush communities; near Dry and McBride creeks
dimeresia	3	7	B/BC	dry, rocky cinder or gravelly soils
harlequin calicoflower	3	1	E	edges of wet meadows, vernal pools
least phacelia	2	14	A-C	moist understory of California false hellebore, willow/tall forb communities in meadows
Mud Flat milkvetch	3	35	A-C	fine loamy soils in low sagebrush and Wyoming big sagebrush communities

Plant Name	Type #	Number of occurrences	Estimated Viability	General Habitat Characteristics
Newberry's milkvetch	4	1	B	coarse, gravelly-sandy soil; erosive, loose gentle to steep slopes; near Simpson's hedgehog cactus
one-flowered goldenweed	4	1	C	on terraces along water courses
short-lobe beardtoungue	4	9	A-C	shallow stony to gravelly loams in low and big sagebrush communities
Simpson's hedgehog cactus	4	15	A-C	rocky or sandy benches and canyon rims in low sagebrush or bud sagebrush communities
Snake River milkvetch	4	11	B-C	loosely aggregated, frequently moving sand and gravelly sand deposits on bluffs/talus/dunes, often with sagebrush
stiff milkvetch	4	16	A-C	rocky hilltops, hillsides and canyon benches of sagebrush communities to lower edge of pine forest; on volcanic, basalt
thinleaf goldenhead	3	19	A-C	gravelly loams in low sagebrush and big sagebrush communities
TOTAL OCCURRENCES		146		

Table 20 – Special status plants not associated with western juniper, but potentially associated with access roads in project area boundary.

Plant Name	Type #	Number of occurrences	Estimated Viability	General Habitat Characteristics
annual brittlebrush	3	3	C	sandy, **well** drained soils in salt desert shrub communities
Cusick's false yarrow	2	5	A-C	open volcanic ash soil (especially Succor Creek Formation)
desert pincushion	4	4	B-C	open, sandy sites in salt desert shrub communities
Malheur cryptantha	4	4	B	bare ash and clay soils on open hillsides
Malheur prince's plume	2	3	B (1D)	dry plains on sparsely vegetated clay soils w/shadscale; 1 EO along possible access road
Malheur yellow phacelia	3	15	A-C	volcanic ash clay soils typically on open, barren slopes
Owyhee clover	2	2	B-C	barren slopes, yellow-green ash & tuff soils; 1 EO along possible access road
Packard's buckwheat	3	3	A-B	gravelly benches on lakebed sediments often w/ shadscale/mixed desert shrub

Plant Name	Type #	Number of occurrences	Estimated Viability	General Habitat Characteristics
Packard’s desertparsley	2	15	B-CD	gravelly benches on lakebed sediments often w/ shadscale/mixed desert shrub
Pueblo Mountains buckwheat	3	1	NA	rocky knoll in gravelly, granitic soil
rigid threadbush	4	7	BC-BD	sandy, cindery soils in salt desert shrub zone
smooth stickleaf	2	19	A-C (1D)	brown, green, or grey volcanic ash
spreading gilia	3	2	C/NA	open areas on sandy to silty soils in salt desert shrub communities
white eatonella	4	13	B-C	dry, sandy or volcanic soils
white-margined waxplant	4	19	B-C (1D)	dry sandy-gravelly or loose ash soils in shadscale/greasewood/salt desert shrub communities
TOTAL OCCURRENCES		112		

3.3.2 Environmental Consequences – Special Status Plants

Up to 258 SSP occurrences could be directly or indirectly affected by juniper treatments: 146 occurrences in habitats commonly occupied by juniper and 112 associated with possible treatment access in the treatment and/or project area. However, potential impacts would largely be confined to the focal treatment area which are presented and discussed for each action alternative below.

Direct Impacts of Project Implementation

Direct impacts to special status plants (SPP) include trampling, breakage, and removal of plants via treatment activities. Impact magnitude would depend on the number of plants affected within an occurrence. Trampling and breakage of SSP would be short term (0-3 years); individual plants would recover within that timeframe providing the damage is not major, there are no additional or repeated impacts, and precipitation is within normal range (compared to 10-year average). Impacts to an occurrence or population from removal of plants would be longer term (3-10 years); recovery would depend on preponderance of annual and noxious invasives, on-going anthropogenic disturbances, and SSP seed bank extent and viability.

Indirect Impacts of Project Implementation

Adverse indirect impacts to SSP include habitat degradation, reduced habitat productivity, and decreased estimated viability by both treatment activities and by juniper encroachment. Impact magnitude would depend on the extent of the area of disturbance. Disturbance from juniper treatment-related activities would produce short-term impacts to SSP and habitat. Juniper encroachment (increases in distribution and density) would degrade SSP habitat over the long term by suppression of understory growth (shrubs and herbaceous plants), leaving areas open to soil erosion and invasion by noxious or weedy species (Allen and Nowak 2008). Suppression of understory growth and shifts in plant community composition would impact ecological

processes (i.e., water and nutrient capture and cycling) degrading SSP habitat over the long term (10+ years). Conversely, juniper abatement in SSP habitat would release understory herbaceous (grasses and forbs) and shrub species previously suppressed by juniper. Recovery of these life forms would improve SSP habitat condition, productivity, estimated viability, and bolster pollinator populations over the long term.

Resilience/Resistance Considerations

In general, most of the SSP EOs have good estimated viability and most of the vegetation communities in the focal treatment areas are in the high category for resistance and resilience (65-67%) (see Vegetation section 3.2.1 and Map 7). Special status plant EOs with high or good estimated viability, particularly in areas of high resistance and resilience, would recover more readily from direct impacts of project implementation and be less likely to incur indirect impacts (e.g., reductions in plant productivity) than EOs with fair or poor estimated viability in areas of low resistance and resilience.

3.3.2.1 Alternative A – No Action

No direct adverse impacts to special status plant occurrences would take place if juniper is not treated in the proposed treatment and/or greater project area. Over the long term, the 146 SSP occurrences that occupy habitats where juniper can survive and thrive (Table 19) would be displaced by encroaching juniper and/or experience habitat degradation due to ecological changes. Long-term indirect impacts to these sensitive plants could be minor to major depending on the rate that juniper density increases or juniper becomes established. Without treatment, the project area would have reduced resistance and resilience to disturbance. As juniper woodlands establish, the likelihood of catastrophic wildfire increases, which would negatively impact SSP.

3.3.2.2 Alternative B – Treatment Including Wilderness

Under this alternative, the 684,000-acre focal treatment area contains 119 SSP occurrences. Duration of direct impacts described above (section 3.3.2) would depend on the degree of damage to plants in an occurrence or population (i.e., trampling and breakage = short-term impact, removal = longer-term impact). Impact magnitude would depend on the number of plants damaged and the disturbance footprint within EOs or populations (the greater the number of plants or area of habitat disturbed, the greater the impact).

Methods and design features detailed in section 2.2.1 (project clearances, avoidance buffers, timing restrictions, and travel/road use requirements) would limit these impacts, and the overall good estimated viability and moderate to high resistance/resilience would encourage recovery. The wilderness minimum requirements analysis (MRA) would also ensure that juniper treatment methods employed in wilderness (i.e., hand tools only, foot traffic only) would cause the least possible disturbance. Overall adverse impacts to SSP would be minor at most.

Long-term vegetation community recovery following juniper treatments would benefit habitat and estimated viability for the special status plant occurrences commonly occupied by juniper (Table 19). Long-term, site specific benefits could be minor to major depending on the extent of juniper encroachment associated with SSP occurrences. Overall benefits to SSP habitat (i.e., habitat integrity) would be slightly greater than Alternative C and slightly less than Alternative

C1, because 31,000 more acres would be treated than Alternative C and 42,000 fewer acres would be treated than Alternative C1.

3.3.2.3 Alternative C – No Treatment in Wilderness

Positive and adverse impacts would be very similar to those described for Alternative B, except wilderness areas (approximately 31,000 acres) would be excluded from juniper treatments. Therefore, up to 110 SSP occurrences in the focal treatment area (9 fewer than Alternative B and 14 fewer than Alternative C1) could be directly and/or indirectly impacted. Long-term benefits of vegetation community recovery would be less than Alternative C1, slightly less than Alternative B, and more than Alternative A.

3.3.2.1 Alternative C1 – Preferred Alternative

Impacts resulting from implementation of this alternative would be nearly identical to those described for Alternative B in non-wilderness; though up to 124 SSP occurrences in the focal treatment area could be impacted compared to 119 occurrences in Alternative B and 110 occurrences in Alternative C. However, more acres of juniper removal (726,000 acres vs. 684,000 acres or 653,000 acres for B and C, respectively) would correlate to greater long-term benefits to SSP habitat. Therefore, while slightly greater numbers of SSP occurrences are at risk of short-term adverse impacts under this scenario, the potential for habitat improvement and therefore population viability would also be greater. Further, application of design features outlined in section 2.2.5 would mitigate negative short- and long-term effects of treatments, so adverse impacts would be minor at most.

3.3.3 Cumulative Impacts – Special Status Plants

3.3.3.1 Scope of Analysis

The geographic scope for the cumulative impact analysis area (CIAA) is the 1.67 million-acre proposed project area (Map 1). The CIAA contains private, state, and BLM-administered lands. This area was selected because it has similar plant community and SSP habitat attributes, land uses are similar across the CIAA, and the direct and indirect impacts resulting from this action would not extend beyond this area. The temporal scope is 30 years for effects from past actions and 15 years for future actions (the timeframe for this project).

3.3.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Current condition of SSP in the CIAA is as described in the Affected Environment above (section 3.3). Past, ongoing, and reasonably foreseeable future actions contributing to current conditions of SSP in the CIAA include livestock grazing, wildfire, road and right-of-way maintenance, fuel break development, and juniper treatments. See section 3.0 for a detailed description of the actions and projects identified here.

Wildfire

Many wildfires have burned within the CIAA (approximately 328,000 acres, 21% of the CIAA) since 1991 with some overlap, though the majority remains unburned. The larger fires include the 2007 Tongue Complex (47,000 acres), the Jacks Fire (49,000 acres), and the 2015 Soda Fire (285,000 acres). Fires have shaped/are shaping the vegetation communities in the project area

where they occurred. Resistant and resilient plant communities remain abundant in the CIAA, and SSP habitat is largely in good condition, overall. Vegetation and special status plant recovery (66 EOs) in the Soda Fire will depend on the extent to which rehabilitation efforts are successful and the site's resistance and resiliency.

Livestock Grazing

There are 143 grazing allotments that intersect the CIAA. Livestock grazing can damage and remove vegetation and disturb soils, especially where the animals tend to congregate (e.g., fences, gates, troughs and supplement sites). These areas tend to be dominated by invasive and weedy vegetation. Special status plant EOs located in or near these areas are likely in poor condition. The BLM applies Idaho Standards and Guidelines, so current and future livestock grazing is projected to maintain or improve vegetation community condition on the whole. However, livestock grazing would likely continue to alter plant communities, particularly in localized areas adjacent to fences, gates and livestock facilities (e.g. troughs and supplement sites) perpetuating disturbance and disturbance-related vegetation in those areas.

Roads and Rights-of-Way

Ongoing maintenance (e.g., blading, grading, and/or spraying) along these features will continue to negatively affect vegetation and SSP habitat within and adjacent to maintained buffers. Blading and grading disturbs soils and vegetation which degrades nearby SSP habitat, or has removed it entirely from the maintenance footprint.

Fuel Breaks

The Bruneau Fuel Break Project (145 miles) and the proposed Tri-state Fuel Break Project (3.5 million acre boundary) would create fuel breaks along established roads in Owyhee County over the next several years. Direct effects include removal of vegetation in the project area. Indirect effects include alterations in species composition (i.e., from current vegetation to seeded species, or reductions in vegetation from mowing and chemical treatments), and reduction in fire size and fire return intervals. Fuel break development and maintenance could degrade or eliminate SSP and habitat directly associated with the fuel break footprint, but could protect and maintain SSP and habitat across the landscape by enhancing wildfire suppression. The magnitude and extent of adverse impacts depends on number/acres of plants disturbed. However, application BLM standard operating procedures and other stipulations or design features outlined in the plans are designed to limit these impacts.

Juniper Treatments

Juniper treatments would have minor, short-term, indirect adverse impacts and minor to moderate long-term benefits as described for Alternative B above. Best management practices and project design features would limit impacts to SSP and habitat. Long-term recovery of vegetation in response to removal of juniper would, in turn, improve SSP habitat in treatment areas.

3.3.3.3 Alternative A – Cumulative Impacts

Special status plants and habitat would be affected in the same manner and to the same degree by the factors listed above, with the exception of future wildfire which is difficult to predict.

Cumulative impacts would, overall, be minor. The absence of juniper treatments would result in minor reductions in overall adverse impacts compared to alternatives B, C, and C1. Wildfires could produce minor to major direct and indirect impacts to SSP and habitat depending on fire size and frequency. Future vegetation rehabilitation treatments (e.g., drill and/or aerial seedings and shrub seedling planting) would offset the impacts of fire to the degree that they are successful.

3.3.3.4 Alternatives B and C – Cumulative Impacts

Alternatives B and C have been combined because there would be no measurable difference between them when addressed with all cumulative actions, particularly since juniper treatments proposed in wilderness under Alternative B would be accomplished on foot and with hand tools. Juniper treatments proposed for these alternatives could produce minor negative additive impacts in the CIAA. Design features, such as avoidance buffers, to minimize disturbance to SSP and habitat and long-term improvements to habitat condition would mitigate these risks.

3.3.3.5 Alternative C1 – Cumulative Impacts

Similar to the other action alternatives, juniper treatments proposed for this alternative could produce minor negative additive impacts in the CIAA. These impacts would be slightly more under this alternative than the other two action alternatives because approximately 36,000 more acres and 73,000 more acres would be treated than B and C, respectively. Again, design features, such as avoidance buffers, to minimize disturbance to SSP and habitat and long-term improvements to habitat condition would mitigate these risks.

3.4 Noxious Weeds

3.4.1 Affected Environment – Noxious Weeds

Noxious is a legal designation given by the Director of the Idaho State Department of Agriculture (ISDA) to any plant having the potential to cause injury to public health, crops, livestock, land or other property (Idaho Statute 22-2402). A noxious weed is commonly defined as a plant that grows out of place and is competitive, persistent, and pernicious (James et al. 1991). The ISDA is responsible for administering the State Noxious Weed Law in Idaho and maintains a list of noxious weeds.

The Boise District BLM has an active weed control program that tracks the locations of noxious weeds and treats known weed infestations using chemical, mechanical, and biological control techniques, or a combination of these. Infestations of noxious weeds are treated contingent upon the BLM annual weed budget, employee availability, and noxious weed priority. The BLM also collaborates with Cooperative Weed Management Areas (CWMAs) that include federal, state, county, and private entities to combat noxious weeds across ownership boundaries. The Eastern Owyhee, Jordan Valley, and Northwest Owyhee CWMAs fall within the project area.

There are nine primary noxious species at risk of encounter and/or spread during juniper treatment activities (Table 21, Map 10[7]). These species vary in density and distribution in the

[7] Map 10 depicts polygons combining noxious weed occurrences buffered by 0.5 mile; often there are many points (occurrences with various spatial extents - 0.1 acre, 1 acre, 5 acres, etc.) clustered in an area.

project area. Most of the recorded weed occurrences are located along/near roads (i.e., disturbed areas along major roads and two-track roads) and are largely associated with mesic (moist) or seasonably wet sites, though many may expand into and occupy drier sites. The vast majority of mapped sites have been chemically treated one or more times in the last 10 years; some biological control has also been implemented for Canada thistle and leafy spurge.

Table 21 – The primary noxious weeds[1] found in the focal treatment area, their abundance and risk of spread.

Species	Distribution[2]	Risk[3]
Canada thistle	common in riparian areas, not present in uplands	high in riparian areas
diffuse knapweed	limited occurrences in uplands	medium throughout
leafy spurge	extensive near Jordan Creek and tributaries, scattered in uplands	high throughout
puncturevine	scattered along roadsides only	medium-high roadsides
rush skeletonweed	limited	high throughout
Russian knapweed	limited	medium throughout
Scotch thistle	common in heavily disturbed sites (e.g., reservoirs), limited elsewhere	medium throughout
spotted knapweed	limited along roadsides	medium throughout
whitetop	common on roadsides, disturbed sites, and near riparian areas	high throughout

[1] A few occurrences of perennial pepperweed, poison hemlock, musk thistle, purple loosestrife, and tamarisk, noxious weeds, and Russian olive, an invasive exotic species, were also mapped in the focal treatment area. However, these species are found in areas (e.g., river corridors, steep water courses, willow and aspen groves were there are no juniper) that do not meet the juniper treatment criteria and were included erroneously as a function of the GIS model; therefore, these species were not included in the table or included in the effects analysis.
[2] Limited – present in only a few locations, individual occurrences generally small (<1 acre); Scattered – sporadically distributed, individual occurrences vary in size (<0.1 acre to 5 acres); Common – widespread, individual occurrences vary in size (<0.1 acre to 5 acres).
[3] Risk of expansion (under current circumstances – i.e., current actions, conditions, uses)

Noxious weeds spread by dispersal of seeds or plant parts in a variety of ways; wind, water, animals, machinery, and people transport seed and plant parts from one location to another. They produce abundant seeds, and many have attaching devices (e.g. hooks, barbs, sticky resins) that facilitate their transport and dispersal. Highways, roads, trails, and river corridors serve as routes of initial establishment and weeds may advance from these corridors into new areas (ISDA 2005). Noxious weeds are capable of invading and dominating disturbed areas (roadsides, areas burned by wildfire, etc.) over a wide range of precipitation regimes and habitats (Sheley and Petroff 1999).

3.4.2 Environmental Impacts – Noxious Weeds

Direct Impacts of Project Implementation

Buffering weed occurrences makes them easier to visualize and provides a picture of the likely area of expansion for analysis purposes.

Transport and deposition of noxious weed seeds via machinery during treatment implementation would be the primary direct impact. Direct impacts also include breakage, trampling, or removal of noxious weeds during juniper treatment activities (i.e., by stepping on, driving over, mastication/shearing operations, or burning); however, these impacts would be negligible to the spread or control of noxious weed populations, particularly with application of design features (section 2.2.5).

Indirect Impacts of Project Implementation

Ground disturbance creating open niches where noxious weed seeds could germinate would be the primary indirect impact. Access roads for juniper treatment, particularly where mastication or shearing machinery is used in the 200-foot juniper treatment footprint adjacent to roads, could become corridors and seed sources for noxious weed establishment and spread. Damage to native plants and soils may reduce plants' overall productivity and competitiveness, creating niches for noxious weeds to occupy. Conversely, short-term (less than 3 years) and long-term (10+ years) recovery of native vegetation (i.e., herbaceous perennials and shrubs, respectively) following juniper removal combined with noxious weed treatments (i.e., integrated weed management) would minimize the potential for noxious species to expand (Sheley and Petroff 1999). Noxious weed inventories and treatments and juniper treatment design features would offset these impacts.

Resilience/Resistance Considerations

The majority of the proposed project area and nearly all of the focal treatment area is 1,524 meters (5,000 feet) or above in elevation. Upland plant communities above 1,524 meters (5,000 feet) elevation are generally less prone to weed spread than those at lower elevations. Greater effective precipitation at higher elevations (or in more northern or north-facing sites) often results in greater perennial plant cover that is better at resisting weed invasion (Miller et al. 2014b). At lower elevations with lower precipitation, plant communities tend to be less resistant and resilient to disturbance and have higher frequencies of noxious and invasive plants. See Vegetation section 3.2.1 for discussion of resilience and resistance and Map 7 for the distribution of plant communities in high, medium, and low resilience/resistance categories.

3.4.2.1 Alternative A – No Action

Noxious weeds would not be affected by juniper treatments or treatment related activities (e.g., ATVs and other machinery). The perennial herbaceous and shrub components of vegetation communities in the focal treatment area would continue to be suppressed by encroaching juniper. The existing noxious weeds would continue to propagate and expand through natural (wind, water, and animals) and other means (recreationists, etc.), particularly in less resilient and disturbed plant communities. The noxious weed program and CWMAs would continue noxious weed inventories and treatments (herbicide application and biological and mechanical control) to minimize their spread.

3.4.2.2 Alternative B –Treatment Including Wilderness

The potential for noxious weeds to spread via implementation of this alternative (approximately 684,000 acres of juniper treatment) is higher than for Alternative A (no treatment), higher than for Alternative C (approximately 653,000 acres of juniper treatment) to a minor extent and lower to a minor extent than Alternative C1 (726,000 acres of juniper treatment). The wilderness

MRA/MRDG would ensure that juniper treatment methods employed in wilderness (i.e., hand tools and foot travel only) would create the least possible disturbance while still obtaining project objectives. Design features detailed in section 2.2.5 (avoidance, monitoring/inventory, cleaning vehicles and machinery, and broadcast seeding native species on burned sites) and ongoing weed treatments (via chemical, mechanical and biological means) would control and/or limit the spread of noxious weeds from activities related to the proposed juniper treatments.

Burning, particularly pile burning, could create small areas of exposed soil, opening niches for noxious weed expansion over the short term until vegetation recovery occurs. If a pile or jackpot fire is more intense or severe than expected due to site conditions, soils could be impacted prolonging recovery of vegetation and/or seed establishment and increasing susceptibility for noxious weed spread at that site. However, jackpot burning and pile burning should produce little soil disturbance and little disturbance to surrounding vegetation, since fires would be implemented during low fire activity times (e.g., when soils are snow covered or frozen). Pile burning cold impact soils and vegetation more substantially than jackpot burning (moderate fire intensity/severity versus low, respectively), but impacts would be limited to pile sites and would be rehabilitated as necessary via seeding or seedling planting. Monitoring and weed control would also occur following treatments. Therefore, the risk of spreading noxious weeds into these sites would mostly be minor. Recovery of native herbaceous perennial plants and shrubs would also be greatest in this scenario; healthy, functioning, native perennial plant communities would stem the spread of noxious weeds over the long term (10+ years).

3.4.2.3 Alternative C – No Treatment in Wilderness

The potential for noxious weeds to expand via juniper treatment activities would be similar to Alternative B, but to a lesser degree as juniper treatments would not be conducted in wilderness (around 31,000 fewer acres). Recovery of native herbaceous perennial plants and shrubs would also be to a lesser degree than Alternative B and to a greater degree than Alternative A.

3.4.2.4 Alternative C1 – Preferred Alternative

The potential for noxious weeds to spread via implementation of Alternative C1 (726,000 acres of juniper treatment) is higher than for Alternative A (no treatment), and somewhat higher than for Alternative B (684,000 acres) or Alternative C (653,000 acres). However, design features outlined in section 2.2.5 (e.g., weed inventory, avoidance, treatment, and monitoring) would limit noxious weed spread and establishment. Recovery of native herbaceous perennial plants and shrubs would also be greatest in this scenario.

3.4.3 Cumulative Impacts – Noxious Weeds

3.4.3.1 Scope of Analysis

The geographic scope for cumulative effects on noxious weed expansion is the 1.67 million-acre project area. This area was selected as the cumulative impacts analysis area because it contains similar plant community components and land uses are comparable. The timeframe for effects from past actions is 30 years and 15 years (the timeframe for this project) for future actions.

3.4.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

The current condition of the CIAA is similar to the focal treatment area described in section 3.4.1, Affected Environment. Weed species recorded in and out of the focal treatment area are the same, except for a few occurrences of yellow starthistle recorded (and treated) in the project area boundary. Past, ongoing, and future actions contributing to noxious weed extent in the CIAA include livestock grazing, wildfire, road and right-of-way maintenance, fuel break development, and juniper treatments.

Wildfire

The 328,000 acres of wildfires previously discussed have influenced the degree to which noxious plants have moved into the vegetation communities impacted by wildfire. Resistant and resilient plant communities remain abundant in the CIAA; however, future wildfires could produce minor to major impacts to plant communities depending upon their extent and severity, which in turn would influence the introduction and spread of noxious weeds. Future rehabilitation treatments (i.e., drill and/or aerial seedings and shrub seedling planting) would offset the impacts of fire to the degree that they are successful.

Livestock Grazing

Livestock grazing would likely continue to alter plant communities, particularly in localized areas adjacent to fences, gates and livestock facilities (e.g. troughs and supplement sites), which may include the spread of noxious weeds. Livestock grazing would continue at current levels into the foreseeable future.

Roads and Rights-of-Way

Ongoing maintenance (e.g., blading, grading, and/or spraying) along these features will continue to affect vegetation within and adjacent to maintained buffers. Blading and grading disturb soils and vegetation and often create conditions conducive to noxious species establishment. Continued spraying of these sites helps to keep weeds relatively restricted to the maintained buffers or to a minimum (e.g., around power line poles, which are kept relatively free of vegetation to prevent fire).

Fuel Breaks

Direct effects of fuel break development include removal or treatment of noxious weeds in the project area. Indirect effects include alterations in species composition (i.e., from current vegetation to seeded species, or reductions in vegetation from mowing and chemical treatments), and reduction in fire size and fire return intervals. Seeded plant communities may better compete with noxious weeds and fewer fires would reduce the potential for noxious weeds in these areas over the long term. Vegetation rehabilitation and restoration projects would impact noxious weeds and their distribution similarly.

Juniper Treatments

Juniper treatments would have minor, short-term, indirect adverse impacts and minor to moderate long-term benefits as described for Alternative B above. Temporary ground disturbance could create niches for noxious weed establishment and spread. However, best

management practices, project design features, and ongoing weed treatments would limit weed spread. Long-term recovery of vegetation in response to removal of juniper would promote more resistant and resilient shrub and perennial herbaceous plant communities. Resistant and resilient plant communities, in turn, would stem the spread of noxious weeds.

3.4.3.3 Alternative A – Cumulative Impacts

Noxious weeds (i.e., their potential for expansion) would be affected in the same manner and to the same degree by the factors listed above. Cumulative impacts would be minor, overall; but could be greater depending on future wildfire extent and severity in the CIAA. The absence of juniper treatments would result in minor reductions in overall impacts compared to alternatives B and C. The extent that vegetation treatments and noxious weed control efforts are successful will dictate the amplitude of the cumulative impacts outlined above.

3.4.3.4 Alternatives B and C – Cumulative Impacts

Cumulative impacts here would also be minor, overall; but, again, could be greater depending upon future wildfire. Juniper treatment activities could produce minor additive impacts in the CIAA. Design features to minimize the potential for noxious weed establishment and/or expansion would mitigate these risks. Cumulative impacts from ongoing and future actions would be identical to those described for Alternative A.

3.4.3.5 Alternative C1 – Cumulative Impacts

Similar to alternatives B and C, juniper treatments proposed for this alternative could produce minor negative additive impacts in the CIAA. These impacts would be slightly more under this alternative than the other two action alternatives because approximately 36,000 more acres and 73,000 more acres would be treated than B and C, respectively. Design features such as herbicide treatment and avoidance buffers would minimize disturbance and weed spread, and long-term improvements to habitat condition would mitigate these risks.

3.5 Wildlife/Special Status Animals

3.5.1 Affected Environment – Wildlife/Special Status Animals

There are a variety of habitat types within the project area that support many different species of wildlife, none of which are threatened or endangered. Greater sage-grouse and several other BLM special status wildlife species (SSW) and State of Idaho species of greatest conservation need (SGCN) occupy the project area. Seven of these species are sagebrush obligates, such as sage-grouse, meaning that they require sagebrush for some part of their life cycle (Paige and Ritter 1999; Idaho Department of Fish and Game [IDFG] 2017). In addition to sage-grouse, the sagebrush obligates include black-throated sparrow, Brewer’s sparrow, sagebrush sparrow, sage thrasher, pronghorn antelope, and pygmy rabbit.

Twenty-eight SSW species have been documented in the project area (Table 22), including 11 mammals, 14 birds, and 3 herpetofauna, i.e., amphibians or reptiles (Idaho Fish and Wildlife Information System [IFWIS] 2017). All of these species have the potential to be affected by the project due to their habitat associations: sagebrush-obligate; shrub-steppe, including saltbush, greasewood, rabbitbrush, or sagebrush; juniper; riparian; or a combination of habitats. One of these SSW species, the Cassin’s finch, occurs in densely forested habitats within the project area. None of the SSW documented in the project area or other wildlife species are known

juniper obligates, meaning there are no species within the project area that require juniper for their life cycle.

Table 22 – BLM Special Status Wildlife Species (SSW) and Idaho Species of Greatest Conservation Need (SGCN) with known occurrences in the project area which may be affected by the project.

Taxa	Species	Habitat Association	SSW	SGCN
Mammals	Bighorn Sheep	Shrub-steppe	X	X
	California Myotis	Shrub-steppe	X	X
	Fringed Myotis	Shrub-steppe or Juniper	X	X
	Long-eared Myotis	Shrub-steppe or Juniper	X	X
	Long-legged Myotis	Coniferous Forest*	X	X
	Kit Fox	Shrub-steppe	X	
	Pygmy Rabbit	Sagebrush Obligate	X	X
	Silver-haired Bat	Deciduous or Coniferous Forest	X	X
	Spotted Bat	Shrub-steppe, Juniper, Conifers	X	
	Townsend's Big-eared Bat	Shrub-steppe or Juniper	X	X
	Western Small-footed Myotis	Shrub-steppe, Riparian, Conifer	X	X
Birds	Black-throated Sparrow	Sagebrush Obligate	X	
	Brewer's Sparrow	Sagebrush Obligate	X	
	Burrowing Owl	Shrub-steppe or Grassland	X	X
	Cassin's Finch	Coniferous Forest incl. Juniper	X	
	Ferruginous Hawk	Shrub-steppe or Grassland	X	X
	Golden Eagle	Shrub-steppe or Grassland	X	X
	Greater Sage-grouse	Sagebrush Obligate	X	X
	Green-tailed Towhee	Sagebrush/Juniper Ecotone	X	
	Loggerhead Shrike	Shrub-steppe/Juniper Ecotone	X	
	Prairie Falcon	Shrub-steppe or Grassland	X	
	Sagebrush Sparrow	Sagebrush Obligate	X	X
	Sage Thrasher	Sagebrush Obligate	X	X
	Short-eared Owl	Shrub-steppe or Grassland	X	X
	Willow Flycatcher	Riparian	X	
Herpetofauna	Columbia Spotted Frog	Riparian	X	X
	Western Toad	Riparian	X	X
	Woodhouse's Toad	Riparian	X	X

*Long-legged myotis also may occur seasonally in shrub-steppe or riparian habitats.

The increasingly rapid and widespread degradation, fragmentation, or total loss of the sagebrush steppe ecosystem throughout western North America makes it one of the most imperiled in North America (Knick et al. 2003; Davies et al. 2011; Rowland and Leu 2011). More than 350 sagebrush associated plants and animals are identified as species of conservation concern (Wisdom et al. 2005). The two biggest threats to sagebrush steppe habitat in southwest Idaho are wildfire and subsequent spread of invasive annual grasses, and the spread of western juniper (OLWG 2000; ISAC 2006, Section 4.3.10). This project focuses on the threat of juniper spread into sagebrush steppe vegetation because as juniper dominance increases across the landscape,

wildlife abundance, species richness, and diversity decline (Miller et al. 2005). Several researchers have documented the negative impacts of juniper encroachment to sage-grouse and other species as well (Doherty et al. 2008; Baruch-Mordo et al. 2013; Donnelly et al. 2016; Coates et al. 2017; Holmes et al. 2017; Prochazka et al. 2017). The spread of juniper and associated loss of sagebrush habitat in southwest Idaho was documented as early as 1969 (Burkhardt and Tisdale 1969). Since that time, hundreds of thousands of acres of habitat for sagebrush obligate species have been identified as lost or degraded due to the spread of juniper within the project area.

The wildlife species analyzed in this EIS are categorized into seven different groups, excluding sage-grouse, which is analyzed separately. Several different species could be analyzed within each group; however the analysis generally focuses on one species from each group, with priority given to sagebrush-obligate and BLM SSW. The migratory bird analysis includes three species to cover multiple habitat types. The sagebrush lizard and pronghorn antelope, neither a BLM SSW nor SGCN species, were added to represent potential impacts to reptiles and large mammals in sagebrush habitats, respectively. The wildlife species used for analysis include:

1. Greater Sage-grouse
2. Raptors – Golden Eagle
3. Large Mammals – Pronghorn Antelope
4. Small Mammals – Pygmy Rabbit
5. Migratory Birds – Brewer’s Sparrow (sagebrush steppe species), Cassin’s Finch (woodland species), Yellow Warbler (riparian species)
6. Reptiles – Sagebrush Lizard
7. Amphibians – Columbia Spotted Frog
8. Bats – Long-eared Myotis

For the analysis, acres of habitat in the project area or potentially affected by action alternatives were determined from: 1) mapped habitat for a species; 2) general cover type classes (Table 14); or 3) canopy cover classes based on Falkowski et al. (2017) (Map 11; Table 3).

Greater Sage-grouse

The Affected Environment section focuses on the project area, but sage-grouse breeding biology and ecology is similar across the Northern Great Basin (NGB) population area. Sage-grouse within the NGB typically congregate on leks (communal strutting grounds) from March to early May. The nesting season occurs soon after, generally extending from May to June, but may start earlier depending on elevation, weather, and plant phenology (Schroeder et al. 1999). Broods remain with females for several more months as they move from early brood rearing habitat (i.e., forb- and insect-rich upland areas surrounding nest sites) to late brood rearing and summer habitats (i.e., wet meadows and riparian areas) from June to August.

Sagebrush steppe ecosystems are declining across the western U.S. and becoming increasingly fragmented due to wildfire and the subsequent invasion of non-native annual grasslands, conifer encroachment, and development (Davies et al. 2011). Declines of sage-grouse have mainly been attributed to habitat loss, fragmentation, and degradation of sagebrush habitats, and several other factors including predation and disease (USDI FWS 2010a). Since conifer encroachment is one of the main threats to sage-grouse in southwest Idaho (OLWG 2000), this project focuses on the

threat of juniper spread into sagebrush habitats and species that depend on these habitats, including sage-grouse. Based on a previous assessment of the West Owyhee Conservation Area for sage-grouse which includes the project area, 11% of the area has been encroached by conifers and 5% by annual grasslands (ISAC 2006). These percentages of conifer encroachment and annual grasslands have likely increased since the assessment, and, thus, sagebrush habitat required for survival of sage-grouse is being lost in the project area.

Sage-grouse habitat in the project area was classified following the Idaho and Southwestern Montana Greater Sage-Grouse Approved Land Use Plan Amendment and Final Environmental Impact Statement (‘ARMPA’; USDI BLM and USDA FS 2015). The three-tiered habitat classification system is based on sage-grouse conservation values in decreasing order: Priority Habitat Management Area (PHMA), Important Habitat Management Area (IHMA), and General Habitat Management Area (GHMA). These three designations are designed to direct management to maintain and improve habitat conditions for long-term persistence of sage-grouse.

Priority Habitat Management Area (PHMA) focuses on conserving the two key meta-populations in the sub-region. These meta-populations consist of a large aggregation of interconnected breeding subpopulations of sage-grouse that have the highest likelihood of long-term persistence. PHMA has the highest conservation value to sage-grouse and incorporates the presence of large leks, habitat extent, movement corridors, connectivity and winter habitat. PHMA also includes adequate area to accommodate continuation of existing land uses and landowner activities. Prior to the 2015 Soda Fire, there were approximately 909,000 acres of PHMA within the project area; roughly 346,000 to 371,000 of those acres fall within the focal treatment areas depending on the alternative (Table 4). The Soda Fire burned approximately 37,000 acres (4%) of PHMA in the project area and 23,000 acres (6%) of the focal treatment area (Map 12).

Important Habitat Management Area (IHMA) contains additional habitat and populations that provide a management buffer for the PHMA and to connect patches of PHMA. The IHMA is typically adjacent to PHMA but generally reflects a somewhat lower sage-grouse population status and/or reduced habitat value due to disturbance, habitat fragmentation, or other factors. Prior to the 2015 Soda Fire, there were approximately 469,000 acres of IHMA in the project area and approximately 201,000 to 232,000 of those acres are in the focal treatment areas depending on the alternative (Table 4). The Soda Fire burned nearly 145,000 acres (31%) of IHMA in the project area but none of these acres fall within focal treatment areas. Within the West Owyhee Conservation Area, 21% of IHMA burned in the Soda Fire. This resulted in a ‘hard habitat trigger’ (see section 1.2 Location and Setting; USDI BLM and USDA FS 2015). As a result, IHMA in the West Owyhee Conservation Area is now managed as PHMA until habitat conditions can be restored to the 2011 baseline.

General Habitat Management Area (GHMA) encompasses habitat that is outside of PHMA or IHMA. The GHMA contains approximately 10% of the occupied leks that have relatively low male attendance compared to leks in PHMA or IHMA. The GHMA is generally characterized by lower quality disturbed or patchy habitat of low lek connectivity. There are approximately 203,000 acres classified as GHMA within the project area, approximately 86,000 to 113,000 of

those acres are within the focal treatment areas depending on the alternative (Table 4). None of these acres burned in the 2015 Soda Fire.

Based on information provided in the ARMPA, there are approximately 680,000 acres of winter habitat in the project area, of which 89,000 acres (13%) were within the Soda Fire perimeter. The ARMPA also identified approximately 1.3 million acres of nesting/late brood rearing habitat in the project area, with just over 607,000 of those acres within the focal treatment area. Approximately 170,000 acres (13%) of nesting/late brood rearing habitat in the project area were within the Soda Fire perimeter.

Within the BOSH project area there are hundreds of thousands of acres of occupied sage-grouse habitat in the early stages of conversion to juniper woodlands, i.e., 87% of the project area is in early stage of juniper encroachment (<10% canopy cover; Table 3 – Focal treatment acres[1] by alternative and method.). Juniper encroachment negatively impacts all sage-grouse habitat types by outcompeting and eventually replacing shrubs, grasses and forbs and by providing perch sites for predators such as hawks and eagles, and for nest predators such as ravens, crows, and magpies (Connelly et al. 2004; ISAC 2006; Stiver et al. 2006; USDI FWS 2010; Baruch-Mordo et al. 2013). In addition to causing a loss of habitat, movement of sage-grouse through juniper stands increases the likelihood of predation, especially on younger birds (Prochazka et al. 2017). In early phase juniper woodlands (<10% canopy cover), for each 1% of canopy cover reduced, survival may increase by 10% (Coates et al. 2017).

As researchers continue to study sage-grouse, there is greater understanding of their habitat needs and the impacts from the continuing spread of juniper. The most recent study on the Nevada-California Bi-State sage-grouse population found that sage-grouse avoid areas with as little as 2% juniper cover (Coates et al. 2017). Stiver et al. (2015) suggest that suitable lek habitat is characterized as having trees absent or uncommon within 3 km of occupied leks. Baruch-Mordo et al. (2013) studied the impacts of western juniper encroachment on sage-grouse and lek activity in eastern Oregon. Results of the Baruch-Mordo et al. (2013) study indicated there were no active leks within 1,000 meters (0.62 mile) of sites having conifer cover greater than 4%. This is significant because lek activity is an important indicator of population-level trends. Moreover, research has shown that 80-95% of sage-grouse hens establish nests within 10 km (6.2 miles) of leks (Holloran and Anderson 2005; Doherty et al. 2010; Connelly et al. 2013), suggesting that maintaining suitable habitat conditions within a 10 km radius of sage-grouse leks is extremely important.

Many of the leks within the project area are monitored annually to document population trends; some leks have been counted for many years. Data collection focuses on counting male sage-grouse because they are more visible due to their white chest feathers and strutting behavior, and because hen attendance is irregular. Some leks were monitored as early as 1955; however, few leks were monitored in the early years and bird counts on specific leks were not completed consistently. Since 1955, there have been 171 different leks documented in the project area. In 2016, 78 of the leks (46%) were occupied, i.e., had at least two males attending during one breeding season in the last five years. Sixty-four of the occupied leks were active in 2016 (Map 13).

In Idaho, sage-grouse populations are monitored and trends analyzed for each Conservation Area to determine whether changes are needed to land management (Governor's Sage-grouse Task Force 2012; USDI BLM and USDA FS 2015a; IDFG 2016). Trends are based on the previous 3-year average of maximum male counts per lek route and compared to the 2011 baseline (IDFG 2016). Management changes are made when habitat or population triggers are reached (see section 1.2 Location and Setting). The type of management changes are decided following the Governor's Sage-grouse Task Force (2012) guidance after a review team determines whether the decline is habitat or population-related and which management actions may be appropriate to minimize the threat.

Statewide, male counts on lek routes in all habitat management areas (PHMA, IHMA, GHMA) were up 18% from 2015 to 2016, but the 3-year average for lek routes in PHMA and IHMA was down 5% from the 2011 baseline (IDFG 2016). Within the West Owyhee Conservation Area, there are only 8 established lek routes, all of which are in PHMA. Four of these lek routes fall within the project area, but are not likely representative because they are on the northern and eastern boundaries of the project area. Trend estimates for leks in IHMA within the West Owyhee Conservation Area are not available and will require several additional years of lek counts (IDFG 2016).

The West Owyhee Conservation Area, particularly the southern portion, is considered a stronghold for sage-grouse, e.g. high lek counts and density, lek connectivity, and likelihood of persistence based on sagebrush cover and fire history (Makela and Major 2012, Major et al. 2016). The southern portion of the project area connects with this high landscape-level priority area for sage-grouse (Map 14) which extends into northern Nevada and southeastern Oregon (Crist et al. 2015). The southern portion of the project area and a few smaller areas within the project area are considered sage-grouse concentration areas (Coates et al. 2015), where density of breeding birds is high and habitat has good conservation value for sage-grouse.

Golden Eagle

Golden eagles are protected under The Bald and Golden Eagle Protection Act (1940) as amended. The BLM manages golden eagle habitat under Executive Order 13186 Sec. 3, which directs federal agencies to promote the conservation of migratory bird populations, and as an Idaho BLM Sensitive Species. The golden eagle can be found in a variety of habitats, but prefers open space or low hills where visibility is good for hunting (Ehrlich et al. 1988; Kochert et al. 2002). The project area contains 19 known golden eagle nests and overlaps with 23 known territories, i.e., within 2 miles (3 km) of a nest (Kochert et al. 2002), mostly along the Owyhee Front between Marsing and Oreana.

The golden eagle feeds primarily on mammals, preferring rabbits and ground squirrels, but will also feed on snakes, birds, and large insects when mammals are unavailable (Collopy 1983; Ehrlich et al. 1988), as well as carrion, particularly during the winter (Kochert et al. 2002). In the project area, golden eagles typically establish nests on cliff ledges, which are abundant in the Owyhee Canyonlands. Golden eagles will also nest on lattice towers from transmission lines, nesting platforms, and tall trees. Generally, golden eagles avoid densely forested areas, but have been documented nesting in shrub-juniper habitats in Utah (Kochert et al. 2002).

Black-tailed jackrabbits are the main prey for golden eagles in the sagebrush steppe of southwest Idaho, although white-tailed jackrabbits and cottontail rabbits and ground squirrels occur in the project area and likely make up some portion of the eagle's diet (Kochert et al. 2002). Loss of sagebrush would reduce the availability of preferred prey, the black-tailed jackrabbits. White-tailed jackrabbits prefer areas of grass with scattered shrubs. The three species of rabbits in the project area are likely a common prey item and important food supply for golden eagles. However, jackrabbits prefer shrub steppe habitat, which is lost when juniper become established. In addition, golden eagles require large open areas to catch their prey. Within the project area, sagebrush steppe cover is decreasing from the spread of juniper across hundreds of thousands of acres. Where juniper encroachment and development is occurring in the project area, the golden eagle is likely being negatively impacted due to loss of open space and reduced abundance of preferred prey.

Two other raptors are associated with open, shrub-steppe habitat: the ferruginous hawk and the prairie falcon. As the golden eagle, the ferruginous hawk feeds primarily on rabbits, but also on ground squirrels (Bechard and Schmutz 1995). Based on a 10-year study of raptors in northern Utah, 73% of ferruginous hawk nests were in live junipers (Smith and Slater 2009). Even though ferruginous hawk is known to use edges between sagebrush steppe and juniper woodlands, including in southern Idaho, it is likely being negatively impacted by juniper encroachment due to loss of sagebrush steppe and prey species associated with those habitats. The prairie falcon nests on cliffs and feeds primarily on ground squirrels, but also other small mammals and birds (Ehrlich et al. 1988). As the golden eagle and ferruginous hawk, it is also being negatively impacted by the loss of open space used for foraging.

Pronghorn Antelope

The majority of the project area is considered suitable habitat for pronghorn (Map 15). Pronghorn is a sagebrush obligate species (Paige and Ritter 1999) that typically inhabits open grasslands, shrub-grasslands, steppes and deserts that provide adequate forage supplies, shelter, and hiding cover for fawns (Yoakum 1974). Forbs and some grasses are the main forage for most of the year. In late fall and through the winter, browse species such as sagebrush and bitterbrush comprise at least 80% of their diet. The Juniper Mountain Wildlife Habitat Management Plan (JWHP) identified declines in the pronghorn population in southwest Idaho back in 1969 (USDI BLM 1969). Habitat for pronghorn in the project area has been degraded by livestock grazing, juniper encroachment, and periods of drought (USDI BLM 1999).

Juniper encroachment into sagebrush steppe and grassland habitats can decrease forage for pronghorns. Even areas with scattered juniper are considered suboptimal habitat for pronghorn, because visibility and mobility are reduced (Yoakum 1980). While antelope will utilize juniper for thermal protection during winter and summer, the majority of pronghorn habitat must have high visibility for long-term health and productivity of the herd (Richardson 2006).

Other large ungulates such as mule deer, Rocky Mountain elk, and bighorn sheep exist within the project area (Map 16). There are 1.29 million acres of elk habitat in the project area (77%), including 777,000 acres of general elk winter habitat. Mule deer winter habitat covers 20% (339,000 acres) and bighorn sheep habitat 39% (644,000 acres) of the project area, including 87,000 acres of lambing areas. Elk and deer may utilize denser stands of juniper for cover during

winter storms. Bighorn sheep prefer open habitats but they will utilize juniper for shade. Juniper is not a major source of forage for any of the large herbivores, although it is consumed during difficult winters when other forage is not available.

While juniper does provide cover for large herbivores, juniper encroachment into surrounding grass and sagebrush communities has negatively impacted large herbivores by reducing diversity and productivity of understory vegetation, resulting in less forage and open space within the project area (USDI BLM 1999; Paige and Ritter 1999; Cox et al. 2009).

Pygmy Rabbit

The pygmy rabbit is the smallest North American rabbit species (USDI FWS 2010b). It is considered rare across its range in the Intermountain West. On September 30, 2010, FWS determined that pygmy rabbits do not warrant listing under the Endangered Species Act; however, it is still managed as a special status species by BLM and as an SGCN species by IDFG.

Pygmy rabbits are typically found in tall, dense sagebrush cover with suitable soil for burrowing. It is one of two rabbit species in North America that digs burrows. This rabbit is a sagebrush obligate species, highly dependent on sagebrush to provide both food and shelter throughout the year (Katzner and Parker 1997). Understory biomass and cover has also been shown to be important (Edgel et al. 2014; Schmalz et al. 2014). Pygmy rabbits have been found from 884 meters (2,900 feet) to over 1,829 meters (6,000 feet) in elevation in southwestern Idaho.

The prehistoric record for pygmy rabbits in the Great Basin documents that their history in this region since the end of the Pleistocene has been one of strong declines in abundance through time (Grayson 2006). Archeological records show a decrease in pygmy rabbit sign correlated with reduced sagebrush and increases in pinyon–juniper pollen (Grayson 2006).

Larrucea and Brussard (2008) revisited pygmy rabbit locations documented before 1950 to determine current presence of the species. Of the 105 sites they surveyed, 14% (15 sites) showed signs of conversion to juniper woodlands, defined as the presence of at least one juniper greater than 2 meters (6 feet) tall. They found that the presence of even a few of these trees at a site generally meant the absence of pygmy rabbits. Woods et al. (2013) found that juniper woodland development leads to a loss of terrestrial cover and reduced forage for pygmy rabbit.

Distribution of pygmy rabbit is not well known across its range as populations can be isolated due to its narrow habitat requirements. Knowledge of pygmy rabbit distribution within the project area is also limited, mainly due to a lack of surveys, however, surveys are currently being completed. Based on surveys over the past few years, a model was developed in 2016 to predict potential pygmy rabbit, similar to Rachlow and Svancara (2003) methodology. Variables included in the model were percent clay in soil, soil depth, slope, shrub height, and the ratio of sagebrush to overall shrub composition (see project record for model description). According to this model, there are approximately 41,000 acres of Priority 1 habitat (P1) and approximately 192,000 acres of Priority 2 habitat (P2) within the project area (Map 17). Based on the research cited above, habitat for this species has been reduced and is not likely occupied where juniper is present.

Brewer's Sparrow

Brewer's sparrow is a BLM sensitive species and FWS Bird of Conservation Concern throughout its breeding and wintering ranges (USDI 2008). Brewer's sparrow is declining steadily and significantly across the West, with sharp declines since 1980 (Paige and Ritter 1999, Dobkin and Sauder 2004). Over the past decade, Brewer's sparrow has declined by 6% across the Great Basin and 3% in Idaho (Sauer et al. 2017).

Brewer's sparrow is one migratory bird species that is protected and managed under the Migratory Bird Treaty Act of 1918 as amended and Executive Order 13186. Accordingly, nests with eggs or young birds may not be harmed nor may migratory birds be killed. Executive Order 13186 directs federal agencies to promote the conservation of migratory bird populations. There are many migratory bird species of management concern that are present in the project area (Table 23).

Table 23 – Migratory bird species documented in the project area by habitat group, species, season of use, management status and population trend.

Habitat Group	Species	Season of Use	Management Status			Trend[1]
			SSW[2]	SGCN[3]	BCC[4]	
Sagebrush Steppe	Black-throated Sparrow	Breeding	X		X	Declining
	Brewer's Sparrow	Breeding	X		X	Declining
	Sagebrush Sparrow	Breeding	X	X	X	Declining
	Sage Thrasher	Breeding	X	X	X	Declining
	Vesper Sparrow	Breeding				Declining
	Green-tailed Towhee	Breeding	X		X	Declining
	Loggerhead Shrike	Breeding	X		X	Declining
	Lark Sparrow	Breeding				Unknown
Juniper Woodlands	Cassin's Finch	Breeding	X			Declining
	Gray Flycatcher	Breeding				Increasing
	Blue-gray Gnatcatcher	Breeding				Increasing
	Black-throated Gray Warbler	Breeding				Unknown
Aspen, Riparian, Wetlands	Yellow Warbler	Breeding				Declining
	Willow Flycatcher	Breeding	X		X	Declining
	Wilson's Snipe	Year-round				Declining

[1]Trend information is based on Breeding Bird Surveys (BBS; Sauer et al. 2017), species accounts from The Birds of North America (Rodewald 2015), and Partners in Flight Landbird Conservation Plan (Rosenberg et al. 2016). "Unknown" means that there is insufficient information to determine accurate trends, or one report indicates a decline and another stable.
[2]BLM Type 2 Special Status Wildlife species (SSW).
[3]Idaho Species of Greatest Conservation Need ("SGCN"; IDFG 2017).
[4]FWS Bird of Conservation Concern (USDI Fish and Wildlife Service 2008).

Brewer's sparrow is one of three passerine bird species considered a sagebrush obligate species, meaning it requires sagebrush for some aspect of its life history. Sage thrashers and sagebrush sparrows are also sagebrush obligate passerines that are present within the project area. Brewer's sparrow utilize sagebrush habitat for nesting and rearing their young and are associated with

sagebrush shrublands dominated by big sagebrush with perennial bunchgrasses (Knick and Rotenberry 1995).

Based on general cover types, at least 80% of the project area is suitable habitat for Brewer's sparrow (see Table 14). According to canopy cover information (Table 3), 87% of the project area contains habitat suitable for Brewer's sparrows which will nest in areas with isolated junipers, possibly up to 10% cover. Brewer's sparrows will also nest in other shrubs within shrub-steppe habitat including rabbitbrush. Sage thrashers and sagebrush sparrows are more selective than Brewer's sparrows in that they only use large patches of sagebrush without junipers. Based on general cover types, approximately 64 of the project area contains suitable habitat for these two species.

There are other migratory bird species that are considered "near-obligates", meaning they are closely tied to sagebrush steppe. Some of the near-obligate species occurring within the project area that use sagebrush steppe as well as open juniper woodlands include green-tailed towhee, loggerhead shrike, and lark sparrow.

Cassin's Finch

Cassin's Finch is a BLM sensitive species. In the mountains of the interior West, Cassin's Finch generally occurs in open coniferous forests, including mature Ponderosa pine and Douglas fir forests, as well as other pine, fir, and spruce stands (Hahn 1996). It is often found in mature coniferous forest types, as well as in juniper woodlands, such as those found in the project area. Such habitat is found in 11% of the project area based on general cover types (Table 14).

Cassin's Finch was previously thought to be abundant in some areas with relatively stable populations (Hahn 1996). However, a recent conservation assessment of migratory birds indicates a declining population in North America, possibly due to changing forest conditions (Rosenberg et al. 2016). Across the Great Basin, Cassin's Finch have increased by 2% from 2005 to 2015, but declined by 1% in Idaho (Sauer et al. 2017).

Old-growth juniper provides good habitat for birds, including several cavity nesters such as ash-throated flycatcher and mountain bluebirds. Compared to grassland, shrubland, or mixed shrubland-juniper, bird species richness and diversity was highest in old growth juniper (Reinkensmeyer et al. 2007). Migratory bird species that depend on juniper (i.e., pinyon jay and juniper titmouse) are not known to occur in the Owyhee Mountains (USDI Geological Survey 2013). Other migratory birds that use juniper woodlands in the project area include gray flycatcher, blue-gray gnatcatcher, and black-throated gray warbler. The black-throated gray warbler and blue-gray gnatcatcher are known to occur in pinyon pine-juniper woodlands. Both species also breed in other forest types, e.g. the black-throated gray warbler in pine-oak forests or Douglas fir forests (Guzy et al. 2012) and blue-gray gnatcatcher in riparian shrubs or trees (Kershner and Ellison 2012). The project area is at the species' northern extent (Guzy et al. 2012, Kershner and Ellison 2012) and there have been few sightings of blue-gray gnatcatcher or black-throated gray warbler in the project area (eBird 2017). Gray flycatchers, on the other hand, occur in the project area and often use juniper woodlands or sagebrush steppe-juniper edges, but may also nest in sagebrush steppe (Schlossberg and Sterling 2013). Juniper encroachment and

expansion with the project area has increased the preferred habitat of these species, as is evident by the fact that population trends for several of these species are increasing (Table 23).

Yellow Warbler

The yellow warbler typically occurs in wet, deciduous thickets, including willow, cottonwood, aspen, and alder (Ehrlich et al. 1988; Rodewald 2015). It is often considered an indicator species of riparian areas, since overgrazed riparian areas or water withdrawal often result in a loss of riparian thickets that yellow warblers nest in. The willow flycatcher, a BLM special status species, is more of a habitat specialist that occupies larger patches of willows, often where there is standing water. Other species that may use riparian areas include the Wilson's snipe which is found in wetlands, such as swamps or marshy edges of ponds and streams. Due to juniper expansion into riparian areas, habitat for these species has been reduced within the project area. Less than 2% of the project area may comprise suitable habitat for the yellow warbler (Table 14). For the purposes of the analysis, the yellow warbler will be used as an indicator bird species of riparian areas.

Sagebrush Lizard

The sagebrush lizard is the most common lizard in the sagebrush deserts of Idaho. This species is commonly considered a sagebrush obligate (Paige and Ritter 1999), but also occurs in greasewood flats and juniper woodlands (Groves et al. 1997). In Idaho, sagebrush lizard's distribution is patchy where suitable habitat exists from the middle of the state to the Nevada border and from sea level up to elevations greater than 3,048 meters (10,000 feet). Habitat for this species (i.e., sagebrush desert) has declined in the project area due to juniper encroachment and development. Suitable habitat for this species is similar to habitat for the Brewer's sparrow.

Columbia Spotted Frog, Great Basin Population

Columbia spotted frogs are a BLM sensitive species and SGCN in Idaho. They live in spring seeps, meadows, marshes, ponds and streams, and other areas where there is abundant riparian vegetation and suitable water conditions for breeding and over wintering. They often migrate along riparian corridors between habitats used for spring breeding, summer foraging and winter hibernation.

Columbia spotted frogs are found closely associated with clear, slow-moving or ponded surface waters, with little shade, and relatively constant water temperatures (Munger et al. 1996; Welch and MacMahon 2005). Reproducing populations have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (e.g., oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters). A deep silt or muck substrate may be required for hibernation and torpor (a state of lowered physiological activity, usually occurring during colder months) (Bull 2005). In colder portions of their range, Columbia spotted frogs will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (Bull 2005); however, they can overwinter in ice-covered ponds (Bull and Hayes 2002; Tattersall and Ultsch 2008).

In 1993, the Great Basin population of the Columbia spotted frog was elevated to candidate status under the Endangered Species Act (ESA), but the species was precluded from listing due to higher priority listing activities. The species remained a candidate species until October 7,

2015, when the FWS announced its determination that the species no longer warranted protection under the ESA. The determination was based on the collaborative conservation efforts with State and private landowners (USDI FWS 2015b), and finding that the species was more widely distributed than previously known. Prior to 1993, Columbia spotted frogs were only known to occur at seven locations in Owyhee County, Idaho (Munger et al. 1996). Since 1993, survey efforts have discovered more frog locations, including several in Twin Falls County, Idaho (Munger et al. 1996). Frogs were found in 7, 6th order hydrologic units (watersheds) prior to 1993 and in 42, 6th order hydrologic units from 1993 to 2012 (USDI FWS 2015b).

Despite the frog's somewhat widespread distribution in Owyhee County, Robertson and Funk (2012) found that Columbia spotted frogs there had small effective population sizes, exhibited low genetic variation, and were highly differentiated from most other sites (Robertson and Funk 2012). However, long-term monitoring at four sentinel sites indicated that these Columbia spotted frog populations appear to be variable but stable (Lohr and Haak 2009).

In Owyhee County, spotted frog habitat has been degraded through conversion of wetlands to irrigated pastures, de-watering of rivers for irrigation uses, drying of ponds due to drought or overuse, and reduction in riparian habitat quality due to overgrazing (Lohr and Haak 2009).

While there are no data documenting impacts of juniper encroachment to spotted frog and their habitat, inference would suggest that encroachment, especially adjacent to occupied habitat, degrades conditions for this species. This inference is based on research documenting the loss of riparian vegetation, increased sediment, and hydrologic changes (Miller et al. 2005; Pierson et al. 2013; Mollnau et al. 2014). The increased levels of shading caused by juniper encroachment would also degrade habitat conditions (Munger et al. 1996).

Long-eared Myotis

All 14 species of bats that occur in Idaho are BLM sensitive species and SGCN in Idaho. They all could potentially occur in the project area: big brown bat, California myotis, canyon bat, fringed myotis, hoary bat, little brown myotis, long-eared myotis, long-legged myotis, pallid bat, silver-haired bat, spotted bat, Townsend's big-eared bat, western small-footed myotis, and Yuma myotis. All but canyon bat, hoary bat, and pallid bat have been documented in the project area. Three species would not be affected by the project due to habitat associations and were excluded from further analysis: Yuma myotis, little brown myotis, and big brown bat. Most bat species in the project area (Table 24) typically do not breed in habitats that may be impacted by the proposed action, but some individuals or foraging habitat could be affected.

Table 24 – Bat species documented in or near the project area, their general habitat, roost type and size, and potential for project effects[8].

Species	General Habitat	Roost Type	Maternity Colony Size[1]	Potentially Affected by Project?
Long-eared Myotis	Shrub-steppe to high elevation coniferous forest, incl. juniper	Exfoliating tree bark, tree cavities, caves, mines,	Small	Yes

[8] Information from Whitaker (1998) and Western Bat Working Group [WBWG] (2017)

Species	General Habitat	Roost Type	Maternity Colony Size[1]	Potentially Affected by Project?
		crevices		
Western Small-footed Myotis	Shrub-steppe, riparian areas, or Douglas fir forest; forage along cliffs	Rock crevices, caves, mines, man-made structures	Small	Possible
Fringed Myotis	Dry woodlands, such as juniper woodlands, but also shrub-steppe	Caves, mines, man-made structures, rocks, decadent trees and snags	Large	Yes
Long-legged Myotis	Coniferous forest; seasonally also riparian and desert habitats	Abandoned buildings, cracks in the ground, cliff crevices, exfoliating tree bark, and hollows within snags; also caves and mines	Large	Yes
California Myotis	Shrub-steppe	Caves, mines, rocky crevices, tree bark, man-made structures	Solitary; Small; or Medium	Yes
Spotted Bat	Shrub-steppe to coniferous forest	Rock crevices	Solitary; sometimes Small	Yes
Canyon Bat	Desert rocky canyons	Rock crevices, mines and caves.	Small	Possible
Hoary Bat	Coniferous and deciduous forest; also desert canyons	Primarily in foliage, near the ends of branches; often at the edge of a clearing.	Solitary	Possible
Townsend's Big-eared Bat	Shrub-steppe and juniper woodlands; limited by roost availability. Travels up to 150 km for foraging.	Caves and mines; also man-made structures, rock crevices, trees	Small; Medium; or Large	Yes
Pallid Bat	Canyons; forages in open grasslands, shrub-steppe or forests	Rock crevices, caves, mines, cavities and bark of trees	Solitary; Small; Medium; or Large	Yes
Silver-haired Bat	Deciduous and coniferous forest	Cavities and bark of trees	Solitary; occasionally Small	Possible

[1]Solitary=1; Small=2-30, Medium=31-100, Large > 100.

Bats spend over half of their lives at roost sites (Vonhof and Barclay 1996), and, therefore, disturbances to roosts can cause negative impacts. The primary threat to long-eared myotis and other bat species is roost disturbance (especially that leading to loss or destruction of roosting structures) (Buseck and Keinath 2004). Many bat species (i.e., fringed myotis, long-legged myotis, and the Townsend's big-eared bat) aggregate in important roost structures during hibernation ("hibernacula") or for rearing young ("maternity colonies") (Table 24). These aggregation sites are typically in caves or mines that provide a suitable environment (humidity, temperature, lack of disturbance) for these important parts of their life cycle.

Since only a few caves or mines may contain a large portion of a population, disturbance to these areas has the potential to have population-level impacts. To date, there is only one known

important bat roost site in or adjacent to the project area. An abandoned mine next to the project area constitutes the largest Townsend's big-eared bat maternity colony in the State of Idaho, consisting of approximately 200 bats (William Bosworth, 2017, IDFG Biologist, Personal Communication). No other large maternity colonies or hibernacula are known in or around the project area. Besides the species listed above that breed in large colonies, the other species in the project area do not aggregate in large numbers and many of them roost in rock crevices or tree bark.

Juniper woodlands are utilized by several species of bats, however, there are no juniper obligate bat species. In New Mexico, Chung-MacCoubrey (2005) documented nine species of bats utilizing juniper woodlands for foraging, roosting, and rearing of young. Eight of the nine species from Chung-MacCoubrey's study have been documented in or near the project area boundary. Szewczak et al. (1998) completed a study of the bats in the White and Inyo Mountains of California and Nevada. They found broad overlap between foraging habitats for 13 species of bats indicating that while bats may forage in juniper, they also readily forage in other habitat types as well.

The western long-eared myotis occurs across most of North America and it can be fairly common if suitable roosting and foraging habitat is present. Long-eared myotis are found in a wide variety of habitats, from grasslands and conifer forests, to humid coastal and montane forests (Manning and Jones 1989). Ponderosa Pine seems to be the most common habitat type for this bat but that could be a reflection of where most studies have been completed. Studies of bats in pinyon juniper have shown this bat to be common.

In a study completed in pinyon-juniper woodlands, Snider et al. (2013) found that tree roosts were not a vital resource for reproductive females of long-eared myotis. Both Snider et al. (2013) and Anthony (2016) documented that females with young prefer rock crevices for maternity roosts, which typically range between 12 and 30 females (Manning and Jones 1989). Male long-eared myotis appeared to roost more equally between rock crevices and trees (Anthony 2016). Long-eared myotis that chose juniper for roost sites used old growth trees that were > 150 years old. O'Shea et al. (2011) documented minimal use of pinyon-juniper trees by long-eared myotis and no use of trees by four other species, three of which are found in the project area including fringed myotis, long-legged myotis, and spotted bat. Bats that do roost in conifer trees most commonly utilize space found under the bark and in hollow cavities. Tirmenstein (1999) states that decadent juniper trees provide cavities that can be utilized by bats for roosting and hibernation.

Anthony (2016) found that long-eared myotis prefer to forage in areas with less than 20% canopy cover. Tocal treatment areas in the project area currently in the early phase of juniper encroachment would thus constitute foraging habitat. There are also numerous old growth trees within the project area that long-eared myotis may use for roosting.

3.5.2 Environmental Consequences – Wildlife/Special Status Species

Sagebrush habitats and the wildlife species that depend on them, including sage-grouse, are now among the most at risk in North America due to habitat loss and fragmentation (Knick et al. 2003; Dobkin and Sauder 2004). Millions of acres of sagebrush habitat in the western states

have been degraded or lost due to wildfire, agriculture, urban development, and shifts in vegetative composition, including juniper encroachment.

Within the BOSH project area, juniper encroachment is a serious threat to wildlife dependent upon sagebrush. In some areas currently with no to little juniper cover, young junipers would become established in sagebrush steppe, rendering these areas unsuitable for sagebrush obligate wildlife species. Juniper development or fill-in is an additional threat to sagebrush habitats and the wildlife species that depend on them. Without vegetation or fuel management, sagebrush habitats with encroaching juniper will transition into closed-canopy juniper woodlands, i.e., where juniper is the dominant vegetation and canopy cover > 30%, within approximately 50 years (Miller et al. 2008; Taylor et al. 2013). This would result in a further reduction in sagebrush habitats and sagebrush-juniper ecotone.

Of the 10 wildlife species analyzed in this EIS, seven are sagebrush obligate species. Even low levels of juniper encroachment negatively impact sagebrush obligates such as sage-grouse and pygmy rabbits (Daubkin and Sauder 2004; Larrucea and Brussard 2008; Baruch-Mordo et al. 2013). Within the project area, the displacement of sagebrush from juniper encroachment has degraded and reduced available habitat for sagebrush obligates and other bird species associated with sagebrush habitat. If the current trend of juniper encroachment continues, sagebrush steppe vegetation across hundreds-of-thousands of acres will become unsuitable over time, leading to the further reduction or extirpation of sagebrush obligate populations from that area. Continued juniper encroachment and development would also have negative impacts to species closely associated with sagebrush habitat and open space: golden eagle, pronghorn, mule deer, bighorn sheep, blacktail and whitetail jackrabbits, and ferruginous hawk.

In contrast to the threats facing sagebrush obligate species, wildlife species that utilize juniper are not threatened by habitat loss. Many species utilize juniper to some degree as cover and food, however, there are no known juniper obligate species. Deer and elk will forage on juniper during severe winter conditions and juniper berries are an important winter food source for some migratory bird species.

3.5.2.1 Alternative A – No Action

No juniper treatment would occur and western juniper would continue to spread into sagebrush habitats and develop into closed-canopy juniper woodlands. While no direct effects to wildlife would occur, indirectly the retention of vast areas of juniper cover and trend of encroached habitats in the project area would indirectly reduce and fragment habitat for sage-grouse and other sagebrush obligate species. In addition to the effects of merely retaining existing juniper cover, juniper development over the next 30-50 years would result in an increase in the percentage of juniper woodlands with closed canopies from 20% to 75% (Miller et al. 2008). Once closed-canopy juniper woodlands, these areas are more likely to experience (what were historically infrequent) high-intensity fires (Miller et al. 2008) that often burn into adjacent vegetation, including sagebrush, and result in the conversion to annual grasslands, e.g. cheatgrass (Taylor et al. 2013; Williams et al. 2017). Once invaded by cheatgrass, fire behavior in these areas changes, permanently making these and adjacent areas more prone to fire, and more difficult to restore. Therefore, continued juniper encroachment and development would lead to a reduction in available habitat for sagebrush-obligate wildlife species and associated

species, increased risk of wildfire and subsequent conversion to cheatgrass, and lower restoration potential. Given the habitat needs of sagebrush obligate species, no beneficial effects to sagebrush obligates and bats would be expected by taking no action regarding juniper encroachment in sagebrush-steppe habitat. Some wildlife species which use sagebrush-juniper edges, such as green-tailed towhee and loggerhead shrike, may benefit from the retention of junipers in the short-term, but in the long-term, these species would also experience reduced habitat availability due to juniper encroachment. On the other hand, Cassin's finch would benefit from the retention of junipers since it occurs in more densely vegetated coniferous forests and habitat would increase without any juniper treatment.

Greater Sage-grouse

Greater sage-grouse are considered an umbrella species of the sagebrush desert. Sagebrush habitats are being diminished by several factors within the project area (as described in previous sections), including the loss of sagebrush habitat to juniper encroachment and development. Juniper encroachment and development is affecting sage-grouse by an increased risk of predation (predators use trees for perching and nesting), and a reduction in nesting, brood rearing and winter habitat, as well as avoidance of leks. Lek attendance also decreases where juniper cover exceeds 4% within 1 km (0.62 mile) radius of a lek (Baruch-Mordo et al. 2013) or even out to 3 km (1.86 mile) from a lek (Stiver et al. 2015). Also, sage-grouse avoid nesting in areas with >3% juniper cover (Severson et al. 2017a). In Nevada, a telemetry study revealed that sage-grouse fly over dense stands of juniper (Coates et al. 2017). The same study found that sage-grouse survival was diminished in areas with few junipers and the authors recommend managing areas for sage-grouse with as little as 1.5% juniper cover. Another study found that young sage-grouse, in particular, are vulnerable to reduced survival in areas with junipers (Prochazka et al. 2017). Therefore, juniper encroachment and development would continue to diminish available habitat for sage-grouse and reduce their survival.

Approximately 13-14% of the project area currently mapped as 10-20% canopy cover would develop into dense juniper woodlands and become unsuitable habitat for sage-grouse. As juniper becomes established or fills in, most of the focal treatment areas with <10% canopy cover would also become marginal or unsuitable habitat for sage-grouse. Therefore, effects of juniper encroachment on sage-grouse in the project area would be major due to lost habitat and reduced survival. In addition, sage-grouse habitat across the project area and the West Owyhee Conservation Area would continue to be fragmented, and there would be a loss of connectivity between habitats which could result in major population-level impacts such as reduced distribution and abundance of sage-grouse in the area.

Golden Eagle

Golden eagles require open space that support their prey as well as allows them to successfully hunt prey. Continued encroachment of western juniper into sagebrush habitat would therefore lead to a loss of foraging habitat and reduced prey availability. Based on areas identified as potential areas of juniper encroachment, i.e., focal treatment area(s), up to 19% of foraging habitat of golden eagle territories currently in the project area would be affected by juniper encroachment and development. This could result in minor to moderate effects to golden eagles and other raptors in the project area that use open habitats of sagebrush steppe. Reduced habitat, prey and nest success could lead to decreased distribution of golden eagles.

Pronghorn Antelope
While pronghorn utilize juniper for thermal cover, the continued encroachment of western juniper into sagebrush habitat would lead to decreased foraging habitat for pronghorn antelope, decreased hiding cover for fawns and other types of shelter, as well as a loss of open space. Pronghorn are more likely to occur in landscapes with > 76% sagebrush cover (Leu et al. 2011). Currently, there are 1.3 million acres of suitable and 305,000 acres marginal pronghorn habitat in the project area. With juniper encroachment marginal habitat would likely become unsuitable and much of suitable habitat would become marginal. Therefore, continued juniper encroachment and development would result in moderate to major effects on pronghorn by reducing and fragmentation of its habitat. Eventually, this could lead to a smaller distribution and fewer pronghorn antelope across the project area.

Pygmy Rabbit
Declines of pygmy rabbit have been correlated with juniper encroachment (Grayson 2006; Larrucea and Brussard 2008). Even a few junipers can result in pygmy rabbit extirpation from a site (Larrucea and Brussard 2008), likely due to loss of cover and forage that these sagebrush-obligate species depend on. Pygmy rabbit habitat identified as focal treatment areas and potential juniper encroachment include 25,000 acres of P1 and 93,000 acres of P2 in the project area. Therefore, continued juniper encroachment would result in reduction of pygmy rabbit habitat within the project area. The loss of sagebrush habitat would result in reduced forage and habitat for burrows and cover, as well as habitat fragmentation. Impacts would be moderate and possibly result in population-level impacts with populations becoming isolated and reduced in numbers.

Brewer's Sparrow
Brewer's sparrow is sagebrush-obligate migratory bird species where declines have been documented with an increase in conifer cover and fragmentation of sagebrush habitat (Aldridge et al. 2011). Continued encroachment of juniper into sagebrush habitat within the project area would thus reduce nesting and foraging habitat for Brewer's sparrow, and increase habitat fragmentation. Impacts would be moderate and possibly lead to a further decline in the distribution and abundance of Brewer's sparrow. Over the long term, impacts on other sagebrush-obligate bird species which are less tolerant of juniper encroachment (i.e., sagebrush sparrow and sage thrasher) would be moderate to major.

Cassin's Finch
Continued encroachment of western juniper into sagebrush habitat and development of juniper would lead to an increase in nesting habitat for the Cassin's finch. With an increase in juniper woodlands, it is likely that Cassin's finch would increase in the project area and possibly the region. Other species that typically utilize juniper woodlands that would benefit from continued encroachment and development of juniper into sagebrush habitats are the gray flycatcher and black-throated gray warbler.

Yellow Warbler
Western juniper is not only expanding into sagebrush habitats, but also into riparian areas. Continued loss of riparian areas to juniper encroachment would result in the loss of riparian

thickets, i.e., the habitat that yellow warblers use for nesting and foraging as well as other riparian bird species. Further separation of riparian thickets that yellow warblers use for breeding or during migration would fragment their habitats further. However, riparian habitats are limited in the project area and therefore potential effects would be negligible to minor.

Sagebrush Lizard

Sagebrush lizards are still common in Idaho's sagebrush deserts, but have been noted as a species of concern in the region (Rowland et al. 2011). Continued encroachment of juniper into the sagebrush desert would result in a reduction of sagebrush lizard habitat, and other reptile species of concern, such as the pygmy short-horned lizard, greater short-horned lizard, and desert horned lizard. The extent of habitat loss would be similar as for Brewer's sparrow. Eventually, habitat loss and fragmentation could affect populations and distributions of sagebrush lizard and other reptiles that occur in sagebrush deserts. Therefore, the long-term effects from juniper encroachment would be minor to moderate for the sagebrush lizard.

Columbia Spotted Frog, Great Basin Population

There is no documentation of the effects of juniper encroachment to the spotted frog; however, the impacts of juniper to stream systems and hydrology (reduced surface water) are likely having a negative effect on spotted frogs. Loss of riparian habitat, increased sediment input, impacts to hydrology, and degradation to aquatic ecosystems that result from juniper encroachment and woodland development (Bedell et al. 1993) would have long-term negative impacts to spotted frog and other aquatic organisms.

Western Long-eared Myotis

No action would lead to infill of areas between old growth trees, resulting in a loss of long-eared myotis habitat. Anthony (2016) states that allowing younger juniper to infill into old growth juniper beyond a threshold of 20% would likely degrade foraging habitat for long-eared myotis. In the long-term, new areas of sagebrush steppe would be colonized by junipers and provide long-eared myotis foraging habitat. Therefore, effects on long-eared myotis would likely be negligible. For other bat species, juniper treatment may result in loss of habitat for some species, and for other species juniper continuing to encroach into sagebrush steppe habitat and infill existing stands of juniper would constitute habitat loss.

3.5.2.2 Common Effects of Proposed Treatments

Juniper Cutting

This action would result in temporary disturbance to wildlife near the cutting area. Some animals near cutting operations would likely seek refuge by leaving the area temporarily or finding suitable hiding cover. Timing restrictions and disturbance buffers would be utilized which would greatly reduce the likelihood of impacts to nesting migratory birds, including raptors, as well as sage-grouse and big game species. Raptor surveys and nest avoidance as well as prohibiting the cutting of old-growth juniper would reduce the likelihood of a raptor nest or a cavity being removed during cutting.

Juniper Mastication/Shearing

This action would result in temporary disturbance of wildlife within the immediate area being treated. Animals near mastication/shearing operations would seek refuge by leaving the area

temporarily or finding suitable hiding cover. Timing restrictions and disturbance buffers would be utilized that would greatly reduce the likelihood of impacts to nesting migratory birds, sage-grouse, and big game. Mastication/shearing operations would not occur in currently occupied pygmy rabbit habitat.

Jackpot/Pile Burning

These methods would have minimal impacts to most species. Burning when soils and vegetation are frozen or moist compared to other times of year results in fewer impacts to soils and a lower likelihood of fire spreading into adjacent habitat. Pile burning could result in mortality to individual animals that are using the piles for cover such as small mammals, amphibians, and reptiles. Big game may be disturbed by activities associated with pile burning late fall or winter, but would likely only be displaced for a day. Activities associated with spring jackpot burning as well as fire have the potential to result in nest abandonment of birds. Impacts to migratory birds and sage-grouse from burning would be minimized by restricting activity to areas where sage-grouse are less likely to be nesting (i.e. areas with > 10% juniper cover) and avoiding the peak migratory bird nesting season. Potential disturbance to birds that may initiate nesting earlier, such as golden eagles, would be minimized with disturbance buffers.

3.5.2.3 Alternative B – Treatment Including Wilderness

The proposed treatment of early phase juniper encroachment would benefit sagebrush obligate wildlife and those species closely associated with sagebrush steppe habitat, e.g. sage-grouse, black-throated sparrow, Brewer's sparrow, sagebrush sparrow, sage thrasher, pronghorn antelope, pygmy rabbit, and sagebrush lizard as well as bats that forage in sagebrush-steppe habitat or open woodlands (Grayson 2006; Baruch-Mordo et al. 2013; Woods et al. 2013; Sandford and Messmer 2014). The proposed methods would maintain sagebrush across the treatment areas and design features as described in section 2.2.5 would minimize impacts to wildlife. Suitable habitat for sage-grouse and other sagebrush obligates would be maintained and improved through the proposed treatment of juniper. The most likely negative effect to wildlife would be temporary disturbance due to juniper removal activities, including the use of chainsaws, heavy equipment, mechanized disturbance, and jackpot or pile burning.

Methods and design features such as timing restrictions and the focus on the majority of the project using light-handed methods would reduce direct wildlife impacts to a negligible level. Mortalities and nest abandonment caused by project implementation could occur on a limited basis. However, the current and continued impacts that would occur from selection of the No Action Alternative increase the likelihood of local extirpation of sagebrush obligate species where sagebrush is lost or reduced. Long-term, the proposed treatment would benefit many sagebrush dependent species, including sage-grouse.

To effectively maintain and improve habitat for sage-grouse and other wildlife closely associated with sagebrush steppe vegetation; efforts should be focused on maintaining environmental and landscape heterogeneity (Hanser and Knick 2011). This is because sage-grouse utilize a diversity of sagebrush species with varying stand characteristics to meet their seasonal forage and life history requirements. The BOSH Project meets the criteria described above because the proposed treatment would maintain a wide diversity of sagebrush species and sagebrush stand characteristics across a large landscape. The diversity of shrub-steppe vegetation and habitat

would also benefit other sagebrush obligate species and wildlife species closely tied to sagebrush steppe habitat (Noson et al. 2006; Woods et al. 2013; Sage Grouse Initiative 2015a and 2015b; Donnelly et al. 2017; Holmes et al. 2017). Therefore, the effects to sage-grouse from the alternatives analyzed in this EIS are at times representative and referenced as the effects to other species in this analysis.

Greater Sage-grouse

Juniper treatment across sage-grouse habitat management areas would occur on approximately 371,000 acres of PHMA, 201,000 of IHMA, and 92,000 acres of GHMA. No mastication of juniper would occur during lekking within 2 miles of leks or during the nesting season within nesting habitat. Other types of juniper cutting, e.g. chainsaw, would not occur during the nesting season. Sage-grouse hens do not normally establish nests near juniper, further reducing the likelihood of impacting nest success. Cutting and mastication could temporarily disturb hens with broods but chicks would be mobile they could simply move away from areas with ongoing implementation. Jackpot and pile burning are not likely to impact sage-grouse during nesting. Most burning would occur prior to nesting season. Furthermore, burning would occur in areas with >10% juniper cover, but most hens do not nest in areas with > 4% juniper cover. These methods would be implemented under conditions (while soils are moist or frozen) and at a scale that reduces risk of losing adjacent sagebrush habitat. No juniper treatments would occur in known sage-grouse winter habitat November through February. Since understanding of sage-grouse winter habitat in the project area is limited, BLM would consult with IDFG prior to any winter treatment to confirm known sage-grouse winter habitat.

As a result of implementation of Alternative B, the threat of encroaching juniper into sage-grouse habitat would be abated by a maximum of 684,000 acres and in up to 41% of the project area. Treatment under Alternative B would improve habitat conditions in and around sage-grouse concentration areas and maintain connectivity between these patches of habitat (Map 14). Sage-grouse may colonize currently unoccupied encroachment areas within a few years following treatment (Severson et al. 2017b). Also, juniper removal has been shown to increase annual vital rates (adult female survival: 6.6%; nest survival: 18.8%) resulting in an estimated 25% population growth (Severson et al. 2017c). Therefore, removing juniper from currently occupied and nearby sage-grouse habitat would benefit the species by maintaining vegetation and conditions required for the persistence of this species.

Golden Eagle

Individual eagles, if present, would experience temporary disturbance and displacement from implementation of the proposed action. During the nesting season, project design features, including seasonal restrictions and buffers around occupied nests would minimize the likelihood of activities associated with juniper treatment temporarily disturbing golden eagle and other raptor species. Disturbance buffers would be maintained at least through July. By late July, the majority of raptor nests in the project area will have fledged and young will be mobile and able to move away from potential disturbance associated with the proposed action. Furthermore, many trees that may be used by nesting raptors in the project area would remain intact since the design features exclude cutting of old growth junipers or deciduous trees. Other nest sites on cliffs would not be affected by the project. Juniper treatment would improve habitat conditions over 31,000 acres of foraging habitat within known golden eagle territories. Overall, the

proposed juniper treatment would benefit golden eagle and other raptor species, such as ferruginous hawk, by maintaining open space and increasing habitat for prey species.

Pronghorn Antelope

This highly mobile sagebrush obligate species would not be directly impacted by any of the proposed methods of juniper treatment. Pronghorn would temporarily move away from activities that would result in disturbance. Timing restrictions would minimize impacts during the fawning season. The proposed juniper treatment would maintain and improve beneficial habitat conditions including cover, forage, and open space across approximately 40% of the project area, including 492,000 acres of suitable habitat and 165,000 acres of marginal habitat. Both sagebrush and riparian habitats are important in pronghorn habitat selection (Leu et al. 2011). Management for such habitat conditions is essential for persistence of pronghorn in the project area and would also benefit mule deer and bighorn sheep.

Pygmy Rabbit

There would be no direct impacts to pygmy rabbit from the proposed action other than temporary disturbance. Much of the proposed focal treatment area is not currently suitable pygmy rabbit habitat due to juniper encroachment. Design features would require surveys in potential pygmy rabbit habitat to avoid direct impacts resulting from heavy equipment associated with juniper treatment (i.e., mastication). Any active burrows would be buffered to avoid impacts from heavy equipment. Over the length of the project, the species would benefit from juniper removal by maintaining sagebrush habitat necessary for its survival and possibly by increasing potential suitable habitat in treated areas.

Brewer's Sparrow

It is expected that juniper treatment under Alternative B would not only improve sage-grouse habitat but also benefit other sagebrush obligate and near-obligate migratory bird species (Sage Grouse Initiative 2015a; Holmes et al. 2017). A study in the Warner Mountains of southern Oregon showed that following cutting of junipers in Phase II (i.e., 10-30% juniper cover) Brewer's sparrow and to a lesser extent green-tailed towhee abundance increased (Holmes et al. 2017). This study also found that conifer removal did not affect the abundance of other species, such as rock wren and mountain bluebird, that use both wooded and shrub habitats, with the exception of gray flycatchers that have increased with juniper expansion.

Juniper treatment would not occur from May 1st through July15th. This timing restriction would reduce the likelihood of direct impacts during the breeding season and there would be minimal disturbance to breeding behavior, and loss of nests, eggs, or nestlings. In the event, that a Brewer's sparrow initiates a nest prior to May 1st and abandons it due to juniper treatment, it would likely try to re-nest. Some bird species that initiate nesting later in the season due to later spring arrival or earlier failed nests, may be affected by juniper cutting after July 15th, if their nest is in a juniper or close to a juniper targeted for removal. This may be particularly true in treatment areas at higher elevations. However, the timing restriction of May 1st through July 15th protects the vast majority of potentially active migratory bird nests from proposed treatments. Therefore, the likelihood of measurable short-term effects to Brewer's sparrow is minor. In the long term, juniper treatment under Alternative B would benefit Brewer's sparrow and several other migratory bird species, including sagebrush obligate and near-obligate species, by

maintaining and improving habitat conditions. The benefits of this landscape-level treatment would improve the likelihood of long-term persistence of Brewer's sparrow and other sagebrush obligate bird species.

Migratory bird species associated with dense juniper stands, such as black-throated gray warbler, would not be affected by the proposed action, since juniper treatment focuses on <20% juniper cover. Also, in untreated areas within and adjacent to the project area, juniper encroachment would continue and may provide additional habitat. Species that utilize the edge of sagebrush and juniper woodlands may be affected by juniper treatment, but many of these species, e.g. green-tailed towhee and loggerhead shrike, also use other types of sagebrush ecotones, including greasewood and dogwood. The gray flycatcher typically occurs in the juniper-sagebrush ecotone but will also use denser juniper stands or heterogeneous sagebrush habitats. The remaining juniper in the vicinity of the project area would provide habitat for bird species that do utilize juniper trees, although no bird species are known to be juniper obligates. Under Alternative B, effects to these species would be negligible.

Cassin's Finch

Juniper treatment would not occur from May 1st through July 15th, thereby reducing potential impacts to Cassin's finch during the breeding season and other migratory birds in juniper woodlands. There would be no negative impacts to Cassin's finch habitat since treatments are targeted early stage juniper woodlands and Cassin's finch typically occur in denser juniper woodlands. Old-growth junipers, which may have cavities, and other dense coniferous forest types would not be cut.

Yellow Warbler

Juniper treatment would not occur from May 1st through July 15th, thereby reducing potential impacts during the breeding season, as with other migratory birds such as Brewer's sparrow and Cassin's finch. The species would benefit from juniper removal in riparian areas where cover of riparian thickets would increase after treatment, particularly if followed with willow plantings. Wilson's snipe is another riparian species that may benefit from juniper removal in riparian areas, at least in the long term, when treatment results in an increased amount of available water, and more open water. Juniper treatment in riparian areas is not likely to increase nesting habitat for willow flycatchers since they typically require large patches of willows for nesting, but will likely result in more habitat for use during migration. In the long term, yellow warbler and other riparian species would benefit from the proposed treatment under Alternative B.

Sagebrush Lizard

Removal of juniper from sagebrush habitat would benefit this reptile found in the project area. Maintaining a diverse community of sagebrush, forbs, and grasses is important for cover and production of insects and other small invertebrate prey species. Cutting juniper may cause temporary disturbance to individuals but most would move away from the immediate area being treated. Mortality due to the use of heavy equipment and pile burning is not likely since these treatments would occur in areas with denser juniper, habitats the sagebrush lizard typically does not utilize. Sagebrush lizards are not likely be affected by jackpot burning since temperatures will still be too cold for reptile activity. Therefore, the level of mortality would be negligible and treatment would benefit this species similarly as for Brewer's sparrows.

Columbia Spotted Frog, Great Basin Population
Human presence and the sound from chainsaws would temporarily disturb spotted frogs but frogs would seek refuge in nearby water if available. Design features would be used to minimize increased sedimentation from any juniper treatment, including, but not limited to: no heavy equipment in riparian areas, no fueling within the riparian areas, and planting willow to stabilize banks. Treatment of juniper would benefit spotted frog over the long-term by reducing fine sediment input to aquatic habitat, increasing the amount of available water, and by promoting the growth and establishment of riparian vegetation adjacent to springs and mesic areas.

Long-eared Myotis
A common effect of project implementation would be temporary disturbance to roosting bats, potential disturbance to large maternity colonies or hibernacula, and possible changes to foraging habitat. Design features to protect known large maternity roosts have been identified (Section 2.2.2.6). Other disturbance to individually roosting bats would be negligible, since long-eared myotis prefer to use rock crevices for maternity roosts or tree bark, as well as several other species in the project area. The likelihood of mortality or disturbance to individually roosting bats is low because old growth, which provide habitat for roosting, would not be cut.

Each bat species in the project area utilizes a variety of habitat for roosting (Table 24). When bats do utilize trees, they generally use trees with cavities or sloughing bark, which are usually only present in old growth and decadent juniper. Old growth juniper with at least one cavity were those used by long-eared myotis in eastern Oregon (Anthony 2016). Because old growth juniper would not be cut, there would be a negligible loss of tree roosting habitat. Other bat species may be positively or negatively affected by juniper treatments, depending on foraging requirements. However, there would still be a broad diversity of juniper habitat across hundreds-of-thousands of acres not proposed for treatment. Removing younger trees among post-settlement trees (i.e., >150 years old) would improve foraging habitat and benefit long-eared myotis, since they prefer areas with <20% juniper cover for foraging and females use old-growth juniper trees for roosting. The proposed action may impact individuals but overall effects to bat species would be negligible for long-eared myotis, Townsend's big-eared bats, or any of the other bat species in the project area.

3.5.2.4 Alternative C – No Treatment in Wilderness

The effects of implementing this alternative would be the same as described for Alternative A in the wilderness areas (31,000 acres) and similar to Alternative B in the treatment areas (653,000 acres). However, the overall magnitude of impacts would be slightly less than Alternative B, as fewer acres would be treated under this scenario. Of the 64 occupied/active leks in the project area, 13 leks are within wilderness where no juniper treatments would occur under Alternative C (Map 13). Wilderness areas also provide some nesting habitat for additional leks adjacent to wilderness areas which would not be treated. Therefore, long-term benefits from Alternative C would be slightly less than under Alternative B for sage-grouse and other sagebrush-dependent wildlife.

3.5.2.5 Alternative C1 – Preferred Alternative

Sage-grouse have been observed in the expansion areas included for this alternative. Under Alternative C1, the increased project area would maintain and improve nesting habitat and provide for improved connectivity between treatment areas on the western, eastern, and southern portions of the project area. By expanding the project area, and thus the treatment area, the survival of sage-grouse would likely increase by lowering the risk of encountering juniper woodlands and associated predators during the breeding season and other seasonal movements. Direct and indirect impacts would be identical to the other action alternatives in non-wilderness; however, impact magnitude would be higher as an additional 73,000 acres of non-wilderness would be treated compared to Alternatives B or C for a total of 726,000 acres. No treatment in wilderness is proposed for this alternative, so impacts to wilderness would not occur as with Alternative A.

3.5.3 Cumulative Impacts – Wildlife/Special Status Animals

3.5.3.1 Scope of Analysis

The spatial and temporal scope for cumulative impact analysis is identified by individual species. Further, temporal scope is considered for actions included in the cumulative analysis.

Greater Sage-grouse

The cumulative effects area for greater sage-grouse is the NGB population which includes portions of northern Nevada, southeast Oregon, southwest Idaho, and northwest Utah. This area incorporates local migration areas and includes the area of potential genetic exchange. Maintenance of habitat in this analysis area is important in providing opportunities for genetic exchange.

Golden Eagle

The scope of analysis for golden eagle for this alternative includes the project area and the area within 10 miles of the project area. This analysis area was determined based on the maximum home range size for golden eagle territories documented in southwestern Idaho (Kochert et al. 2002) and is recommended by FWS for development projects (Pagel et al. 2010).

Pronghorn Antelope

Pronghorn migration within the project area is not well understood. Most pronghorn that utilize summer range in the project area likely winter at lower elevations along the Owyhee Front. Some may migrate up to 50 miles, most of which would be within the project area (Jake Powell 2015, IDFG Biologist, Personal Communication). Based on this information, the analysis area for pronghorn is the project area.

Pygmy Rabbit

The analysis area for pygmy rabbit is the same as greater sage-grouse. This analysis area is appropriate because it includes several isolated populations, and maintenance of habitat in this area would enhance suitability of habitat and the opportunities for genetic exchange.

Brewer's Sparrow

The analysis area for Brewer's sparrow is the same as greater sage-grouse. This species is closely aligned with sage-grouse habitat and effects from impacts to habitat would generally be the same for both species.

Cassin's Finch
The analysis area for Cassin's finch is the project area.

Yellow Warbler, Sagebrush Lizard, Columbia Spotted Frog
The analysis area would be the same as for greater sage-grouse.

Long-eared Myotis
Most temperate bats are known to hibernate, and in the case of long-eared myotis, hibernation in Idaho is speculated since an enormous amount of energy would be required to migrate to climates that would provide an adequate food source. Hibernacula documented for other bat species are usually in caves or mines, with temperatures that do not fluctuate or drop below freezing (Buseck and Keinath 2004). Hibernacula for long-eared myotis are not known in Idaho. However, the Owyhee Canyonlands have the potential to provide suitable sites for roosting in deep cracks and crevices. With little known about long-eared myotis seasonal movements and potential hibernacula, the project area is the analysis area for this species.

3.5.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Current conditions for each species and their habitats are similar to what was described in the Affected Environment above (section 3.5.1). Past, present, and reasonably foreseeable future actions that have had, are having, and/or are expected to affect wildlife in their defined CIAAs include juniper treatments, recreation, wildfire, livestock grazing, exurban development, and fuel breaks, and are described in more detail in section 3.0 (Affected Environment and Environmental Consequences). Potential cumulative impacts that may affect wildlife species are addressed by actions below.

Juniper Treatments
Other actions occurring in the cumulative effects analysis area include the Pole Creek and Trout Springs juniper treatments which involve broadcasts burns covering approximately 47,000 acres. The reason for broadcast burning these areas is because the juniper stands are in the mid to late stages of woodland development and there is little sagebrush remaining across the project areas. The Tongue Complex in 2007 burned adjacent to the Pole Creek and Trout Springs project areas and native vegetation responded very well. A similar response would be expected from the proposed broadcasts burns in Pole Creek and Trout Springs.

Broadcast burning to treat late stage juniper encroachment would benefit sagebrush-obligate species, but those benefits may take 20-40 years to be realized (Bates et al. 2011). Treatments that remove juniper without the loss of sagebrush steppe vegetation would provide immediate benefits. Past, ongoing, and future juniper projects would likely benefit sagebrush-obligate species for around 30 years or longer if the treatment areas are maintained.

Recreation

The types of recreation that occur in the cumulative effects analysis area are numerous and will likely increase in the future. Those most likely to negatively impact wildlife, including sage-grouse, are OHV use, hunting, and bird watching during the breeding season. In addition, recreational climbing, caving and mine exploration can disturb roosting bats and potentially spread a deadly fungus, white-nose syndrome, affecting several species of bats in North America (WBWG 2017).

There is little documentation of direct mortality to wildlife from OHVs, although physical impairment and stress does occur from hearing loss, increased metabolic rates, escape responses, reduced reproductive output, and disruptions to foraging (Bury et al. 1977; Berry 1980; and Canfield et al. 1999). OHV use can lead to habitat degradation, reduced patch size, reduced nest success, population declines, interruption of life-history events, and cause disturbance from both noise and presence (Marler et al. 1973; Luckenbach and Bury 1983; Wakkinen et al. 1992; Aldridge and Brigham 2002; Havlick 2002; Wisdom et al. 2004; Brooks and Lair 2005; Barton and Holmes 2007; Ouren et al. 2007; and Steenhof et al. 2014). Effects from recreation would occur into the foreseeable future under current recreation management.

Wildfire

The degree of cumulative impacts from wildfire are highly variable for several reasons such as the fire intensity, size of the fire, the vegetation condition before the fire and growing conditions after, and the land management following the fire. Sagebrush steppe at lower elevations is often replaced by non-native invasive annual grasses after a wildfire. This conversion of sagebrush steppe to non-native annual grasslands is one of the main threats of sagebrush-obligate species in southwest Idaho and elsewhere in the Northern Great Basin.

Areas burned by wildfire in sagebrush habitat at higher elevations have a much greater likelihood of recovering. Sagebrush in such areas can begin to provide habitat for sage-grouse and other sagebrush-obligate species within 20 years, but is dependent on the factors identified above. Areas of juniper woodlands burned by wildfire can take a much longer time to recover because the sagebrush seedbed is likely depleted.

Livestock Grazing

Ongoing and future livestock grazing is projected to maintain and improve upland vegetation, following terms and conditions of grazing permits and meeting Idaho Standards of Rangeland Health and Guidelines for Livestock Grazing Management. There are currently 143 grazing allotments spanning the BOSH Project. Grazing has the potential to alter site-specific vegetation, including sagebrush habitats and riparian areas. However, permits and other measures would require adjustments to grazing allotments not meeting rangeland health standards by changing the timing, frequency, intensity, and/or duration of grazing. Therefore, even though there could be localized impacts to wildlife, current and future management would ensure that potential effects would not rise to population level impacts.

Other potential impacts associated with grazing could occur from disturbance, nest destruction, and fences. Fences delineating grazing allotments and pastures can result in avian collisions (Hovick et al. 2014), including sage-grouse (Stevens et al. 2012). Avian collision risk depends on flight behavior and physiology of birds, with birds such as wading birds and grouse at higher

risk due to the combination of heavy body and small wings (Bevanger 1998). Overall, fences have not been related to an increase in predators or habitat fragmentation that otherwise might be associated with roadsides or habitat edges (Trombulak and Frissell 2000). Trees, cliffs, and buildings provide better vantage points for avian predators compared to fence posts. Therefore, potential impacts from fences associated with grazing allotments are limited to avian collisions. Efforts are ongoing to mark fencing in proximity to sage-grouse leks (i.e., higher risk of collision; Stevens et al. 2012) by BLM and other agencies. Without juniper treatment or changes to livestock grazing, cumulative impacts would occur across the cumulative effects analysis area until juniper was treated or until changes to livestock management were made.

Mining

Past mining activity has resulted in some habitat loss and fragmentation. Within and adjacent to the 1.67 million acre project area, 94% of the estimated 9,785 acres with mining activity are at the Kinross Delamar Mine, west of Silver City which is currently being rehabilitated and reclaimed. There is some additional mining activity at active mineral leases on state lands. Due to the relatively small extent of current mining activity and past habitat loss, cumulative effects would be negligible to wildlife, with the possible exception of bats. Since mining activity only has the potential to affect bats, this action is not discussed further for other wildlife species. In the event that an important bat maternity colony or hibernaculum is found during mine exploration or reclamation, disturbance buffers would be maintained to minimize disturbance to bats.

Exurban Development

Past and ongoing development for energy, agriculture, housing, etc. has resulted in the loss of sagebrush habitats and further habitat fragmentation. Most of the future exurban development in or near the project area would occur along the Owyhee Front. Loss of habitat to exurban development would be long-term (greater than 50 years) and may be permanent.

Fuel Breaks

Several fuel break projects are currently being implemented: the Bruneau Fuel Breaks Project includes 92 miles of mowing and 52 miles of seeding to create fuel breaks. Under the Soda Fuel Break Project, fuel breaks will be developed along 271 miles of roads. The Tri-State Project is still in the early planning phases but would include a network of fuel breaks to connect with others in Nevada and Oregon.

Establishing fuel breaks reduces nesting habitat and cover in the short term, particularly the year following treatment. However, developed fuel breaks have been used by sage-grouse for foraging, loafing areas, roosting, and lekking (Destin Harrell, BLM Biologist, Personal Communication 2011; Graham 2013; Michael McGee, BLM Biologist, Personal Observation 2015). Fuel breaks can provide habitat for wildlife, including sagebrush-obligate species. Some species such as jackrabbit and cottontail rabbits may increase along newly created habitat edges of fuel breaks (Pierce et al. 2011). For other wildlife, fuel breaks alter habitat, reduce cover and may increase habitat fragmentation. However, potential impacts to wildlife may be offset by benefits of fuel breaks to sagebrush-obligate species by augmenting the ability of firefighters to contain and control wildfires, thereby potentially reducing the number of acres of sagebrush habitat lost to fire and subsequent conversion to invasive annual grasslands.

3.5.3.3 Alternative A – Cumulative Impacts

Greater Sage-grouse

Past, present, and foreseeable future actions within the project area would continue to affect sage-grouse in the cumulative effects analysis area, including continued juniper encroachment and development, recreation, wildfire, livestock grazing, and exurban development. Sage-grouse may benefit over the long term from fuel breaks by protecting sagebrush steppe habitat from fire, as well as ongoing juniper treatments that may result in habitat restoration.

Overall, juniper encroachment and wildfires would fragment and shrink suitable habitat for sage-grouse and other sagebrush-obligate wildlife species. The impacts to sagebrush habitat from wildfire would be cumulative with the continued spread of juniper. The timeframe of impacts could be short-term (15-50 years) or long-term (greater than 50 years). Continued juniper encroachment would lead to a reduction in sagebrush steppe vegetation including forage available for livestock. These areas would also receive increased pressure due to recreation and grazing. Loss of sagebrush habitat, such as for sage-grouse, from these past, present, and future actions would be cumulative with continued juniper encroachment under Alternative A across all management zones.

Golden Eagle

Past, present, and foreseeable future actions within the project area would continue to have negative impacts on golden eagle in the cumulative effects analysis area, particularly wildfire and the conversion of sagebrush steppe to invasive annual grasslands. Exurban development would continue, with most occurring along the Owyhee Front and within the Snake River Plain. This would result in long-term (> 50 years) impacts and permanent habitat loss.

Continued juniper encroachment would also decrease open foraging habitat for golden eagle as well as habitat for their preferred prey. Recreation would continue to have some impacts on golden eagles, particularly in or adjacent to the Snake River Plain. Grazing, particularly in combination with juniper encroachment, would likely result in resources confined to smaller areas and additional pressure on sagebrush steppe. Fuel breaks would alter habitat but likely not degrade habitat for prey species. Benefits of fuel break development and juniper treatment would be offset or diminished due to continued loss of prey species habitat through juniper encroachment, wildfire, and exurban development. Therefore, these benefits would not be realized with selection of Alternative A.

Pronghorn Antelope

Ongoing and future actions would continue to decrease and degrade habitat for pronghorn within the project area. Wildfire and the subsequent conversion of sagebrush steppe to invasive annual grasslands, increased exurban development and resulting pressure by recreationists, would continue to negatively affect pronghorn in the cumulative effects analysis area. Impacts from exurban development and recreation would be similar as those described for sage-grouse and golden eagle. Juniper treatment has the potential to restore open space and foraging habitat for pronghorn. However, with selection of the No Action Alternative, these benefits would be offset by continued juniper encroachment and diminishment of sagebrush steppe. Fuel breaks would likely improve cover and forage for pronghorn in the short term, and long term potentially retain more sagebrush steppe by preventing large wildfires across the project area. With continued

juniper encroachment under Alternative A, there would be increased competition for resources between antelope and livestock. Therefore, there would be cumulative effects from grazing, as well as wildfire, recreation, and juniper encroachment on pronghorn due to a loss of open space and foraging habitat. While juniper treatment and fuel break development would result in beneficial cumulative effects, these benefits would not be realized under Alternative A.

Pygmy Rabbit

Past, present, and foreseeable future actions within the project area would have similar negative impacts on pygmy rabbit as those on sage-grouse. However, for pygmy rabbits, fuel breaks would reduce forage, decrease cover, restrict movements, and increase habitat fragmentation, eventually limiting dispersal and population genetic exchange. Some of these effects may be offset by benefits of fuel breaks, i.e., the retention of larger tracts of sagebrush steppe. While design features can be incorporated to reduce the level of impacts, selection of Alternative A would lead to loss of habitat from increased levels of juniper and a likely reduction and fragmentation of pygmy rabbit habitat through fuel break development. The negative cumulative impacts from development of fuel breaks and selection of Alternative A would be long-term (greater than 50 years).

Brewer's Sparrow

Similar to pygmy rabbit, fuel breaks could reduce cover, increase habitat fragmentation, and possibly reduce nest success. Unlike pygmy rabbits, dispersal capabilities would not be limited due to fuel breaks. Impacts from ongoing and future actions from juniper treatments, recreation, wildfire, livestock grazing, and exurban development would be the same as for sage-grouse with selection of Alternative A. Even though fuel breaks would likely have a negative impact on Brewer's sparrow, over the long term and across the landscape, Brewer's sparrow may benefit from fuel breaks by retaining larger tracts of sagebrush steppe, the habitat they depend on. While juniper treatment would result in beneficial cumulative effects and fuel break development in positive or negative cumulative effects, benefits would not be realized with selection of Alternative A.

Cassin's Finch

Past, present, and foreseeable future actions within the project area would continue to have impacts on Cassin's finch in the cumulative effects analysis area, including juniper treatments, wildfire, and recreation. Juniper treatments would reduce habitat in some areas. Impacts from recreation would likely be negligible, particularly since OHV use is limited. Fuel breaks, exurban development, mining, and livestock grazing would likely not result in cumulative effects on Cassin's finch. Overall, continued juniper encroachment under selection of Alternative A would benefit Cassin's finch since it would result in an increased amount of suitable habitat.

Yellow Warbler

As with sage-grouse and Brewer's sparrow, impacts from ongoing and future actions from juniper treatments, recreation, including OHV use and bird watching, wildfire, livestock grazing, and exurban development would be similar for yellow warbler with selection of Alternative A. Yellow warbler habitat is often susceptible to degradation of riparian areas and reduced cover since livestock often congregate in riparian areas with highly palatable forage. Fuel breaks would have no effects on yellow warbler, since these would not be established in habitats yellow

warblers use. Over the long term, yellow warblers may benefit from fuel breaks since they could potentially prevent larger wildfires from burning into riparian habitat. Juniper treatments could improve some riparian habitat for yellow warblers, but these benefits would be offset with continued juniper encroachment into riparian areas under selection of Alternative A.

Sagebrush Lizard

Past, present, and foreseeable actions within the project area would have similar impacts as those for pygmy rabbit under Alternative A.

Columbia Spotted Frog, Great Basin Population

Impacts from ongoing and future actions would be from grazing and juniper encroachment with selection of Alternative A. Recreation is typically low in spotted frog habitat and therefore would not result in cumulative impacts. Impacts from wildfire would depend on existing condition of spotted frog habitat and levels of juniper encroachment. Areas in good condition for spotted frogs would likely recover relatively quickly, whereas wildfire in juniper-encroached riparian areas may see increased levels of sediment input and reduced habitat quality.

The meadows, springs, marshes, and streams that provide spotted frog habitat are very attractive to livestock because of the highly palatable forage. Livestock congregate in such areas and often degrade aquatic conditions. Areas with juniper encroachment are more susceptible to bank damage and more susceptible to overgrazing from livestock. Properly managed grazing would not add to effects from juniper encroachment, but grazing that degrades aquatic habitat would lead to negative cumulative effects with selection of Alternative A.

Exurban development and fuel breaks would not have any effects on Columbia spotted frogs, since these would not affect their habitat. Juniper treatments could enhance riparian habitat for Columbia spotted frogs by improving aquatic habitat conditions via a reduction of sediment input into aquatic systems, followed by maintenance or establishment of riparian vegetation. However, these benefits would be offset with continued juniper encroachment and livestock grazing under the No Action Alternative.

Long-eared Myotis

Past, present, and foreseeable future actions within the project area would continue to have negative impacts on long-eared myotis in the cumulative effects analysis area, including continued juniper encroachment and development. There would be no cumulative impacts to long-eared myotis due to exurban development or recreation, since these actions occur mainly along the Owyhee Front and not in the woodlands with <20% cover that long-eared myotis prefer or in areas with suitable roost sites. Potential impacts from recreation also are likely negligible, since OHV use is limited in juniper woodlands. The project area does not have the geology of karst, which often has several caves that might be susceptible to recreational caving. There would be no cumulative impacts from wildfire since bats may be resilient to landscape-scale fire and some species preferentially select burned areas for foraging, perhaps facilitated by reduced clutter and increased post-fire availability of prey and roosts (Buchalski et al. 2013).

Juniper treatments would also not result in cumulative impacts since old growth juniper is not targeted, but some loss of old growth could occur and reduce tree roosting habitat. Impacts

would be offset by potential benefits of opening up areas for foraging. Mining will continue into the future and open pit mines would lead to a potential loss of habitat. Adits and underground mines will likely create suitable roosting and hibernating habitats, particularly once abandoned. There would likely not be cumulative effects from mining and juniper expansion because of the minimal amount of acres involved in open pit mines. Livestock grazing managed under the standards and guidelines would not have cumulative impacts to bats. Fuel breaks may result in beneficial cumulative impacts to long-eared myotis by reducing the risk of large wildfires spreading from sagebrush steppe habitats into adjacent juniper woodlands. Continued juniper encroachment under selection of Alternative A would have negligible effects on long-eared myotis since some foraging habitat would be lost, but in other areas new foraging habitat would become established with juniper encroachment.

3.5.3.4 Alternative B – Cumulative Impacts

Overall, the temporal scope of cumulative effects associated with action alternatives would be long-term (greater than 50 years) if actions to maintain sage-grouse habitat continue into the future.

Greater Sage-grouse, Pygmy Rabbit, Brewer's Sparrow, **Sagebrush Lizard**
Potential effects from recreation, wildfire, livestock grazing, exurban development, and fuel breaks on sage-grouse, pygmy rabbit, Brewer's sparrow, and sagebrush lizard would be the same as described under Alternative A. However, under Alternative B, juniper treatment occurring in the cumulative effects analysis area would benefit sage-grouse and other sagebrush-obligate species. The result of those benefits would vary depending on the level of encroachment being treated and the location of treatments relative to occupied sage-grouse habitat. Past, present, and future juniper removal projects have and would have beneficial cumulative effects to sage-grouse with implementation of the Alternative B. Benefits from this alternative and its proposed juniper treatments would offset cumulative impacts from recreation, exurban development, and fuel breaks.

Benefits to these species from proposed juniper treatment may also offset cumulative effects from livestock grazing, which can lead to localized degraded habitat conditions for sage-grouse and other wildlife species by reducing cover and through competition for resources (Mosconi and Hutto 1982; Schulz and Leininger 1990; and Fleischner 1994). Ongoing research on different grazing practices and the response of sage-grouse may inform future management (University of Idaho 2017). The proposed action would maintain and improve habitat conditions for this group of species. Additive effects from the proposed action and livestock grazing would be unlikely.

Wildfire has led to the loss of millions of acres of sagebrush habitat across the west. The proposed action would benefit sagebrush obligate species by maintaining and improving a diversity of sagebrush habitat conditions across the landscape through removal of encroaching juniper. Fire occurring within suitable sagebrush habitat would decrease habitat for this group of species and offset, or diminish the benefits of juniper treatments. However, wildfire in stands of juniper that eventually recover to sagebrush would provide long-term beneficial cumulative effects in conjunction with the proposed action.

Golden Eagle

Ongoing and future actions related to recreation, wildfire, livestock grazing, and exurban development would have similar impacts on golden eagle as for sage-grouse under Alternative B, which would be offset by the benefits from the proposed juniper treatment, thereby maintaining or improving habitat for golden eagle prey species. Fuel breaks alter habitat for wildlife, but would not degrade habitat for jackrabbits. Therefore, any cumulative impacts from other ongoing and future actions, including recreation and exurban development, would be offset by reducing the impacts of juniper encroachment with Alternative B and would lead to positive cumulative effects to this species.

Pronghorn Antelope

Past, present, and foreseeable future actions within the project area would have similar negative impacts on pronghorn antelope as for sage-grouse. For effects due to juniper treatment, recreation, wildfire, livestock grazing, and fuel breaks, see sage-grouse cumulative effects for Alternative B. Fuel breaks would likely increase preferred forage for pronghorn and help maintain habitat by potentially retaining acres of sagebrush steppe otherwise lost to wildfire. The proposed action would also maintain suitable forage species and maintain open space for pronghorn. There would be positive cumulative effects from the proposed action under Alternative B and the development of fuel breaks.

Yellow Warbler, Columbia Spotted Frog (Great Basin Population)

Impacts from ongoing and future actions from recreation, wildfire, livestock grazing, exurban development, and fuel breaks to yellow warbler and Columbia spotted frog would be the same under Alternative B as with selection of Alternative A. Several of these impacts, such as wildfire and livestock grazing, would be offset by benefits to riparian habitats associated with proposed juniper treatment under Alternative B. Ongoing and future juniper projects would be expected to improve aquatic habitat conditions by improving hydrologic function, reducing shading, and reducing sediment input into aquatic systems. Riparian vegetation would be maintained or able to reestablish in areas where it has been reduced from juniper encroachment. This would result in positive cumulative effects with implementation of the proposed action with selection of Alternative B.

Cassin’s Finch

Any impacts from ongoing and future actions resulting from recreation, wildfire, livestock grazing, exurban development, fuel breaks, and mining would be the same under Alternative B as with selection of Alternative A. Since juniper encroachment will continue in untreated areas within and adjacent to the project area, any cumulative effects would be offset by continuing juniper encroachment.

Long-eared Myotis

Any impacts from ongoing and future actions resulting from recreation, wildfire, livestock grazing, exurban development, fuel breaks, and mining would be the same under Alternative B as with selection of Alternative A. Cumulative impacts associated with proposed juniper treatment under Alternative B would benefit long-eared myotis by reducing areas of juniper encroachment or development and improving riparian habitats.

3.5.3.5 Alternative C – Cumulative Impacts

The cumulative effects associated with Alternative C are identical to the Alternative B where treatments would occur and identical to the cumulative effects of Alternative A in wilderness areas where treatments would not occur.

3.5.3.6 Alternative C1 – Cumulative Impacts

Similar to other Alternatives B and C, juniper treatments would result in positive additive impacts for most species analyzed within the CIAA. Cumulative impacts for long-eared myotis would be offset. Beneficial impacts would be slightly more under this alternative than the other two action alternatives because approximately 42,000 more acres would be treated than in Alternative B, and 73,000 more acres than in Alternative C. Design features, including timing restrictions and disturbance buffers would be used to minimize impacts to wildlife and long term, treatment would improve habitat conditions for greater sage-grouse and other sagebrush-obligate wildlife species.

3.6 Hydrology

3.6.1 Affected Environment – Hydrology and Water Quality

Riparian Areas

In the western United States, riparian areas comprise less than 1% of the land area, but they are among the most productive and valuable natural resources (USDA NRCS 1996). All riparian areas possess similar ecological characteristics: energy flow, nutrient cycling, water cycling, hydrologic function, and support of plant and animal populations. Riparian areas are the interfaces between water courses (e.g., rivers and streams) or water bodies (e.g., ponds and springs and associated wet meadows) and the uplands, and are characterized by riparian vegetation (e.g., rushes, sedges, willows, alders, and cottonwoods). Riparian vegetation is important for maintaining the integrity of ecological processes of riparian areas and waterways.

The project area for each alternative contains numerous riparian areas including streams, springs, and wet meadows (Map 18). Streams and springs are generally classified as either lotic (flowing water) or lentic (still water) depending on the behavior of the ground water or surface water and the interaction of the groundwater with the Earth's surface.

Plant communities vary in response to hydrologic conditions. Many riparian areas in this region exhibit characteristics of both lentic and lotic environments, such as springs discharging water diffusely across high and low gradient wet meadows. This access to water enables certain plant species to thrive. Obligate wetland species (plants that occur in saturated soils) include Nebraska sedge and coyote willow. Facultative wetland species (plants that usually occur in saturated soils but are occasionally found in seasonably dry soils) include Baltic rush and Wood's rose. Riparian vegetation decreases water velocities and traps sediment, and has densely matted root systems that stabilize soils and stream banks. Riparian areas provide habitat for aquatic organisms as well as terrestrial species (e.g., upland birds, ungulates, small mammals, insects, and reptiles) that utilize them as a source for water, food, and cover.

Hydrologic Condition

Anthropogenic Influence

Some riparian areas within the project area have experienced significant levels of development (e.g., reservoir construction, stream channel alteration, and water diversion) and degradation

(e.g., hydric soil compaction, stream straightening, and stream channel incision) over the past 200 years. In order to survive in a semi-arid desert, homesteaders developed and manipulated water sources for domestic and agricultural uses (e.g., piped water to troughs, crops, etc.). Transportation networks were also developed across the project area and these have had negative effects to waterways and riparian areas. Natural, low intensity wildfires have basically been eliminated from the landscape through wildfire suppression. These actions have altered the hydrologic and geomorphic balance of riparian areas within the project area by changing channel gradients, sinuosity, and access to floodplains. As a result, the natural ability of streams to transport water and sediment within the watersheds has been altered. Where anthropogenic disturbance has occurred, the hydrologic and geomorphic balance has degraded the condition of the stream systems as well as their ability to retain stable stream banks and transport natural levels of sediment.

Juniper Encroachment

Encroachment by juniper can impact lentic and lotic systems by altering the shrub-steppe environment to a juniper-dominated environment, causing a pronounced change in the hydrologic and geomorphic setting of this landscape. Juniper is able to establish and dominate upland and riparian vegetative communities. Juniper trees compete with upland and riparian plants for space, water, and nutrients. Juniper roots on mature trees extend out past the crown of the tree and can outcompete and occupy root space utilized by adjacent plant species. In one study, nine mature juniper trees occupied the entire root zone of an acre of ground (Gedney et al. 1999). Aggressive root behavior combined with the juniper canopy stresses adjacent and understory herbaceous plants and shrubs, suppressing recruitment of these plants. In turn, bare ground increases both under the juniper canopy and the space between juniper canopies (intercanopy). Juniper has also been shown to reduce the amount of water available in shallow soil horizons, as well as deeper soil horizons such that available water in the deeper soil horizons are maintained at a depleted state and are rarely recharged (Mollnau et al. 2014; Roundy et al. 2014b).

Currently, juniper has expanded its range across the uplands and into riparian areas which has led to degraded hydrologic conditions across the project area. Areas of late stage juniper have had a greater impact due to the amount of bare ground in the interspaces and below trees, and due to its impacts to hydrologic processes. Areas of early stage encroachment still have a mixed plant community and generally are in better condition than areas with late-stage encroachment. Hydrologic processes are generally still functioning appropriately in areas of early stage encroachment.

Water Quality

Currently there are 606 miles of streams within the project area for Alternative B and C and 642 miles of streams within the project area for Alternative C1 that are listed within Category 4A (TMDL completed and approved by EPA) or Category 5 (waters not meeting water quality standards for one or more beneficial uses) of Idaho Department of Environmental Quality’s 2012 Integrated Report due to excessive sediment.

3.6.2 Environmental Consequences – Hydrology and Water Quality

3.6.2.1 General Impacts of Juniper Encroachment

Development of juniper woodlands leads to an increase in bare ground and alters the way water flows over the ground surface and infiltrates into the soil. The lack of grasses, forbs, and shrubs in the understory allows water to flow over land rather than infiltrate into the soil profile. Sheet flow of surface water across the soil can create erosional features including rills and gullies. The accelerated runoff and erosion rates caused from an increase in interconnected bare ground between the juniper canopies can greatly increase the sediment yield and impact water quality within an affected watershed (Pierson et al. 2010). This process occurs in upland systems as well as in riparian and wetland systems. Juniper dominated environments experience more evapotranspiration and earlier snow melt than sagebrush dominated environments; snow drifts tend to be larger and last longer in sagebrush dominated environments (Kormos et al. 2017). This indicates that snowmelt occurs earlier and over a shorter time period in watersheds that have a reduced sediment and water retention ability due to increasing juniper densities.

The excess of sediment and accelerated water flow entering the system shifts stream equilibria causing increased erosion and deposition features within a watershed and a loss of stream bank stability. Juniper roots can dominate the root zone, but they are not as densely matted as riparian vegetation (i.e., willows, sedges, and rushes). Where juniper dominates riparian areas, vegetation that decreases water velocities and root matter that stabilizes the sediment is often lacking. The result is an unstable stream bank that is less capable of withstanding high energy flows.

With increased surface water velocities and discharge, stream channels tend to incise (lowering of the stream channel elevation) until a new equilibrium is achieved; increased incision lowers the localized water table and removes the connection of the natural flood plain to the stream system. The loss of surface water and groundwater to the flood plain reduces the viability of riparian plant species and allows upland plant species to expand into riparian systems. This, in turn, reduces the functionality of the stream system making recovery to natural conditions unlikely without restoration efforts. Moreover, further degradation of these stream systems would be expected for the foreseeable future due to the abnormal amounts of sediment within the stream systems and the unstable stream channels related to a loss of riparian vegetation and channel incision.

3.6.2.2 Alternative A – No Action

No juniper would be removed and existing juniper trees would continue to mature and reproduce leading to further encroachment. Existing and encroaching juniper in riparian areas and adjacent upland areas would continue to change plant community composition, causing an increase of bare ground and impacting the integrity of hydrologic processes. Diminished hydrologic function would cause lasting effects to the sagebrush shrub steppe environment, including a departure in functioning condition of riparian and wetland areas and a decrease in stream stability within the project area.

If juniper encroachment is left unabated, the hydrologic flow regime of groundwater and surface water within affected watersheds would be altered for the foreseeable future. The geomorphic

structure of the landscape within the affected watersheds would be altered from its current condition, and would be more susceptible to erosional events.

3.6.2.3 Alternative B

The National Hydrography Dataset (NHD) identifies 16 miles of canals, 1,786 miles of intermittent streams, 405 miles of perennial streams, and 549 springs within the focal treatment area of Alternative B. The project focuses on treating juniper in the early stages of encroachment; however, areas in later stages of juniper encroachment (≤5 acres) may also be treated. Because of the importance of riparian areas for sage-grouse brood rearing and due to the negative impacts to hydrologic function, juniper growing in riparian areas that meet the criteria outlined in section 2.2.1 (Project Area Development, Treatment Focus) would be targeted. Treatments of late stage juniper are expected to be a minor percentage of the total area treated.

For example, of the 549 springs in the focal treatment area, the 533 springs in non-wilderness may be treated if small patches (≤5 acres) of late stage juniper occur and are suitable for treatment (see sections 2.2.1 Project Area Development). If each spring were treated, which is unlikely, there would be approximately 2,750 acres (0.4% of the focal treatment area) of late stage juniper treated which would produce negligible hydrologic impacts. No treatment of late stage juniper would occur in wilderness.

The BLM anticipates that a large proportion of riparian areas would not be treated because sage-grouse prefer meadow habitat associated with low gradient streams and many streams already have developed juniper stands that exceed the criteria for treatment. Where treatment does occur within riparian areas, felled juniper would either be moved outside the greenline or limbed and left in place, depending on the need for sediment control or the needs of sage-grouse. Juniper trees removed from riparian and wetland areas would be staged in small slash piles and burned when ground and fuel moisture levels are high enough to reduce impacts to soils. The trunks of trees cut in riparian areas may be left in place and limbed to promote contact with the ground surface when other vegetation is not present to reduce sediment travel. Juniper mastication would not occur within riparian or wetland areas (Design Features, section 2.2.5).

Juniper treatments could have several short-term (0-3 years) effects to riparian areas and wetlands including newly exposed soils where juniper is removed and localized burned areas nearby where juniper is piled and burned. Effects would be less pronounced for early stage encroachment because interspatial and understory species would largely be intact. Effects would be more pronounced in areas with larger juniper trees and late stage encroachment because trees with large canopies or more closed canopies likely have greater areas of exposed soil. However, the amount of later stage juniper expected to be treated is minimal. Additionally, methods and design features detailed in section 2.2.1 would help mitigate these potential impacts via sediment control measures, willow plantings, phased treatment, leaving boles and branches on site, and/or stabilizing banks with felled trees. Over the long term (greater than 3 years), benefits to these areas would include a return of desirable riparian plant communities (e.g., willows, rushes, and sedges) resulting in an increase in stream bank stability and an increase in functioning condition of lentic and lotic riparian environments.

The extent of sediment movement and resulting impacts would increase with greater slope in the riparian and wetland areas, and with increases in the amount of bare soil under the juniper canopy. The short-term effect of bare ground would last until riparian vegetation recovers (i.e., adjacent vegetation recolonizes the sites). The majority of the focal treatment area (87%) is in the early stages of juniper encroachment indicating an intact understory of grasses, forbs and shrubs, which would reduce the likelihood of sediment movement. Vegetation is expected to establish in the footprint of the juniper removed within one to three growing seasons depending on annual precipitation levels.

There would be substantially fewer short-term (0-3 years) effects in areas treated by mastication where residue (juniper chips, etc.) covers bare soil. In such cases, increased infiltration rates and lower sediment yields can be expected compared to bare soil left to revegetate from adjacent plant communities (Cline et al. 2010).

Long-term effects of treating riparian and wetland areas would include a return to desired obligate and facultative wetland plant species, and maintenance of existing desired vegetation. Desired wetland plant species would increase the functioning condition of riparian and wetland areas. A return to the natural hydrologic flow to lentic wetland environments and increasing the stability of stream banks and stream channels in lotic environments would also occur. Removing juniper would increase the amount of groundwater and habitat for desired wetland plants, and would enable existing plant communities to increase vigor. Increased vigor of desired wetland plant species within riparian and wetland areas would, in turn, aid in the natural development of floodplains, retain and filter sediment within the stream channel, and increase the functioning condition of the stream system.

Juniper removal treatments would produce minor, adverse short-term impacts by exposing bare ground beneath cut trees (e.g., increase sedimentation). However, the design features (section 2.2.5) would mitigate some of the sediment movement, and the long-term benefit of desirable riparian vegetation recolonizing areas currently occupied by juniper would stabilize soils, streambanks, and stream channels, and will far outweigh the initial short-term effects from sediment movement.

3.6.2.4 Alternative C – No Treatment in Wilderness

The NHD identifies 16 miles of canals, 1,688 miles of intermittent streams, 379 miles of perennial streams, and 533 springs within the focal treatment area of Alternative C. Juniper removal from riparian and wetland areas would take place outside wilderness within the focal treatment area (653,000 acres). Short-term impacts to hydrologic processes and water quality in untreated areas (31,000 acres of wilderness) would be identical to Alternative A, and would be identical to Alternative B where juniper treatment occurs (653,000 acres). Long-term (greater than 3 years) impacts to hydrologic processes and water quality within the untreated wilderness would be identical to Alternative A, but may also influence conditions outside of the untreated wilderness within the project area. Where juniper is removed, the long-term benefits would be as described for Alternative B (stabilization of soils, streambanks, and stream channels).

Treatments of late stage juniper are expected to be a minor percentage of the total area treated. There are 533 springs in the focal treatment area may be treated if small patches ($\leq$5 acres) of

late stage juniper occur and are suitable for treatment (see sections 2.2.1 Project Area Development). If each spring were treated, which is not likely, there would be up to 2,670 acres (0.4% of the 653,000-acre focal treatment area) of late stage juniper treated which would produce negligible hydrologic impacts.

Erosion features (gullies, rills, and other water flow features) that are developing or may develop in untreated wilderness areas have the ability to influence portions of watersheds that are not currently affected by juniper encroachment. Upper reaches of watersheds from affected wilderness areas would likely see destabilized streams as surface erosion is enhanced within the early stage juniper areas and surface runoff is increased due to the decrease of herbaceous vegetation. The resulting sediment load would adversely affect the water quality and geomorphology of downstream reaches of the stream systems. The treated area within the project area would see the effects from increased sediment movement due to the creation of uncovered bare ground. However, adjacent vegetation would reduce sediment movement. Design features (section 2.2.5) would mitigate some of the sediment movement and the long-term effects from desired vegetation establishing in the cut junipers footprint will provide stabilized soil, streambanks, and stream channels and will far outweigh the initial short-term effects from sediment movement.

3.6.2.5 Alternative C1 – Preferred Alternative

The NHD identifies 16 miles of canals, 1,916 miles of intermittent streams, 414 miles of perennial streams, and 600 springs within the focal treatment area of Alternative C1. Juniper removal from riparian and wetland areas would take place within the focal treatment area. Treatments of late stage juniper in riparian areas are expected to be a minor percentage of the total area treated. Overall short- and long-term impacts to hydrologic processes and water quality would be as described for Alternative B in non-wilderness and alternative C, but would be greater in magnitude because 73,000 more acres would be treated.

Treatments of late stage juniper are expected to be a minor percentage of the total area treated. There are 600 springs in the focal treatment area that may be treated if small patches (<u><</u>5 acres) of late stage juniper occur and are suitable for treatment (see sections 2.2.1 Project Area Development). Up to 3,000 acres (0.4% of the 726,000-acre focal treatment area) of late stage juniper may be treated which would produce negligible hydrologic impacts.

3.6.3 Cumulative Impacts – Hydrology and Water Quality

3.6.3.1 Scope of Analysis

The spatial extent of the cumulative impacts analysis area (CIAA) is the Bruneau, East Little Owyhee, Jordan, Middle Owyhee, Middle Snake-Succor, South Fork Owyhee, and Upper Owyhee watersheds (8th digit Hydrologic Unit Code (HUC), fourth level cataloging unit). These watersheds (8,620,220 acres total) incorporate the entire project area and are considered within the cumulative impacts analysis as hydrologic changes within portions of watersheds have the potential to propagate throughout the entire watershed.

Re-vegetation of herbaceous species in areas where mastication and/or jackpot burning occur is expected to take 0-3 years to re-vegetate. Direct and indirect effects to riparian and wetland areas

would dissipate once the area has been treated and desired plant species reestablish. The proposed action is expected to take 10-15 years to complete. The direct and indirect effects would dissipate up to 3 years following the last treatment unit; as a result, cumulative effects will be considered through 2036.

3.6.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

The current conditions of the riparian and wetland areas within the project area have been affected in several ways from European settlement. Homesteads have been established across the region and the majority of the reliable water sources have been developed for agricultural uses. Roads have been constructed to provide a transportation network across the region enabling agricultural, recreational, and industrial use to occur. Woody encroachment of the sagebrush steppe has increased in areas that historically did not contain high densities of mature juniper trees. There have been a number of past and current juniper treatment projects occurring within the cumulative impact analysis area to reduce the amount and scale of juniper encroachment. Large range fires have occurred within the treatment area within the past 10 years that have altered the local landscape. Livestock grazing has occurred historically and currently at some level throughout the analysis area.

The combination of development of the rangeland within the project area by European settlers, construction of road networks, increased encroachment from juniper trees, juniper management projects, large range fires, and livestock grazing have all had significant impacts on the past, current, and future hydrologic system within the project area. Watersheds within the project area have been and are in the process of reaching a hydrologic equilibrium influenced by these specific disturbances.

Development of Riparian and Wetland Areas

Development of the project area in the 1800s by European settlers has had a significant impact to the condition of the riparian and wetland areas. Homesteaders needed reliable water sources to function as a population center and for agricultural uses. This need for reliable water has led to the development and alteration of both lotic and lentic areas. Water diversion structures were constructed on both springs and streams to deliver focused flow of spring water and surface water to houses, troughs, and irrigated pasture land. These water diversion structures include dams, canals, and spring boxes. As a result, both water quantity and the timing of water availability have changed in cumulative effects analysis area watersheds and stream systems. Some watersheds have had a significant amount of water diverted out of them, while other watersheds have had an increase in water to their stream systems. This alteration of water supply has resulted in significant changes to the geomorphic and hydrologic function of some of the stream systems in this region.

Roads

The construction of road networks has also caused a significant change in the condition of the riparian and wetland areas within this region. Roads have been constructed within floodplains, across stream channels, and within lentic areas. Roads occurring within stream channel floodplains have a negative impact on the stream channel by reducing the amount of space the stream has developed naturally within and has access to. This leads to a straightening of the

stream channel which increases stream velocities causing incisions of the stream channel. Increased sediment loads have a dramatic impact on the downstream reaches of the stream system and will alter the geomorphic structure of the stream network. An incised stream channel will cause the local water table to drop, disconnecting the riparian floodplain vegetation with its water source.

Roads constructed across stream channels impact the ability of the stream channel to naturally meander. Many of the roads constructed across stream channels have either a culvert installed to divert surface water under the road, or a low water crossing. If culverts and water crossings are improperly designed, they have the tendency to create erosional features such as head cuts, resulting in incised channels. Lentic areas are also prone to degradation when roads are constructed through them. Lentic areas within this region usually have diffuse surface and groundwater flow creating wet meadow type environments. Roads constructed within a lentic area will cause a focusing and linear change in the flow pattern of the wet meadow, resulting in negative impacts to the wet meadow environment.

Juniper Encroachment

Woody encroachment of riparian and wetland areas by juniper has been ongoing for decades. This encroachment has altered the local hydrology in affected watersheds and will continue to adversely affect additional watersheds, as it continues. Changes to the hydrology include increased erosion and sediment deposition, reduction in native wetland vegetation, reduction in stream bank stability, and reduction in lentic and lotic surficial area. These impacts have been occurring within the project area, but are expected to become more pronounced within the treatment area as the early phase juniper trees mature.

Juniper Treatments

Multiple juniper treatment projects have been completed or are currently being conducted to reduce the amount and density of juniper within sagebrush steppe habitat. These treatments include the Pole Creek (21,000), Trout Springs (23,000 acres), and South Mountain (730 acres), treatments (see section 3.0). Treatment methods for those projects include broadcast burning and hand cutting/girdling, with the slash either being jackpot burned or scattered. Broadcast burning would create negative erosional conditions for the short term before desired, resilient plant populations repopulate the treated area. Eventually, erosion and sediment yields would start to return to normal levels and areas affected by heavy juniper encroachment would see increased resistance to erosional events. Areas of cutting and jackpot burning would see localized negative short-term effects until desired plant species repopulate the bare ground.

Wildfire

Rangeland fires have occurred within the project area in the recent past and have had impacts to the current conditions. Large fires that have occurred in the project area are the Tongue Complex (47,000 acres) in 2007, the Jacks Fire (49,000 acres) in 2012, and the Soda Fire (182,000 acres) in 2015. These fires have had significant effects to the hydrology across the landscape. The removal of shrubs and herbaceous understory has dramatically increased the amount of surface water runoff and sediment. The increase in water and sediment impact the functioning condition of riparian and wetlands, which generally last until vegetation recovers (less than 3 years) and the stream systems distribute the excess sediment.

The Tongue Complex occurred long enough ago that vegetation has re-established and sediment loads have decreased to near normal levels. The Jacks Fire was more recent, but vegetation has had over four years to recover and decrease the amount of erosion and sediment loading occurring in stream systems within and downstream of the burned area. The Soda Fire is the most recent large-scale fire in the project area and direct and indirect negative effects including excessive erosion and sediment deposition are occurring and will continue to occur for the next 3 years. Once vegetation re-establishes, these direct and indirect effects should subside.

Livestock Grazing

Livestock grazing has been occurring for over a century within the analysis area. Stocking levels of livestock have fluctuated within that timeframe and some lasting impacts have been observed from historic grazing: terracing, incision of stream channels, and other erosional features. Since 1997, BLM has managed livestock grazing according to the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management. Standard 1 applies to watershed processes, Standard 2 and Standard 3 apply to hydrologic processes within stream and wetland systems, and Standard 7 applies to water quality. The BLM manages livestock grazing to meet these standards.

3.6.3.3 Alternative A – Cumulative Impacts

The hydrologic conditions of the project area would continue to deviate from the present condition and erosion and sediment loads would increase. Over time, desirable riparian plant species would be replaced by juniper where woodlands develop, leaving stream systems more susceptible to erosional events. Livestock grazing that meets rangeland standards and objectives would not have an additive effect of hydrologic degradation within the project area. These processes in combination with the level of development and alteration already present would cause a significant degradation to the hydrologic and rangeland conditions in the CIAA where juniper treatments are not completed.

3.6.3.4 Alternative B – Cumulative Impacts

The proposed treatment would cause short-term sediment loads within the treatment area when combined with the other cumulative actions and impacts outlined above. The increase in desired plant species that would result from the proposed action would cause an increase in the functional condition of riparian and wetland systems over the long term; therefore, the proposed juniper treatment would increase proper functioning hydrologic properties and water quality in the CIAA and help stabilize the watersheds that have already had erosional events and deviations from natural conditions. Livestock grazing that meets rangeland standards and objectives would not have an effect to hydrologic condition degradation within the project area in conjunction with the proposed action and the cumulative actions across the project area. The long-term effects of the treatment along with the cumulative effects would far outweigh the short-term impacts.

3.6.3.5 Alternative C – Cumulative Impacts

Additive impacts in this scenario would be nearly identical to Alternative B. The 37,000 acres (5% of the treatment area proposed for Alternative B) of wilderness would not be treated, so those hydrologic properties and water quality would be affected similarly to Alternative A.

3.6.3.6 Alternative C1 – Cumulative Impacts

Additive impacts in this scenario would be nearly identical to Alternative B within the treatment area. The 31,000 acres of wilderness within the project area would see the same cumulative effects as Alternative C. The project area and focal treatment area are expanded and the effects of the treatment along with the cumulative effects of other actions and events would be observed over the CIAA.

3.7 Fisheries

3.7.1 Affected Environment - Fisheries

Fish habitat in the project area includes perennial and intermittent streams and reservoirs that support fish through at least a portion of the year. Within the project area, there are an estimated 500 miles of perennial streams and a limited number of reservoirs (Map 18) that provide year round fish habitat. There are approximately 4,669 miles of intermittent streams. Intermittent streams can be occupied by fish throughout the year where pools remain and they can be used for various life history phases such as spawning or juvenile rearing. Intermittent streams can be vital for maintaining aquatic biodiversity.

The condition of fish habitat within the planning area is related to the hydrologic condition of the uplands and riparian areas. Riparian areas form ecological links between terrestrial and aquatic habitats on the landscape, and serve as buffers to reduce overland flow and sediment movement. Habitat has been negatively impacted due to juniper encroachment. Establishment of juniper in both the uplands and riparian areas leads to increased amounts of bare soil, increased surface runoff, and increased erosion (Bates et al. 2000; Pierson et al. 2013; Pierson et al. 2015). Areas dominated by juniper have been shown to have levels of rill erosion 15 times higher compared to areas with no or low levels of juniper (Pierson et al. 2007; Pierson et al. 2013). Because juniper root systems do not hold soils like riparian species, juniper growing along stream banks also increases bank instability. Increased bank instability leads to fine sediment input, widening or incising of stream channels, and loss of habitat. Additionally, juniper has been shown to reduce the amount of water available in shallow soil horizons as well as deeper soil horizons such that available water in the deeper soil horizons are maintained at a depleted state and are rarely recharged (Mollnau et al. 2014; Roundy et al. 2014b) and this in turn can impact stream flows.

In contrast, healthy riparian areas supporting species such as cottonwoods, willows, sedges, forbs, and desirable grasses along stream channels dissipate streamflow energy, reduce erosion, and help hold streambanks together, store water for release during the dry summer months, and provide habitat for aquatic wildlife species such as fish, macroinvertebrates, and amphibians. Riparian vegetation species such as cottonwood, willow, box elder, and alder provide shade, which moderates water temperatures (Rosenberger et al. 2015), adds stability and structure to streambanks, inputs large woody debris that adds habitat complexity, and produces organic material that is a food source for macroinvertebrates. Juniper encroachment has decreased the shrub and herbaceous vegetation components in both upland and riparian areas often leaving bare ground (Pierson et al. 2010).

Fish Species and Distribution

Approximately 300 perennial stream miles in the proposed project area are documented to support fish populations. These streams provide habitat for both cool-water and cold-water adapted fish species

Redband trout, speckled dace, redside shiner, and bridgelip sucker are the most common and widely distributed native fish known to occur in the project area; chiselmouth and longnose dace are less common, but are relatively widely distributed. General species and habitat information for these widely distributed fish assemblages is presented below.

Redband Trout
Redband trout (RBT) is a subspecies of rainbow trout found in the Columbia Basin east of the Cascade Mountains. RBT is a BLM special status species throughout its distribution. The species is present in the Owyhee, Bruneau, and Snake Rivers and their associated tributaries, including the majority of perennial streams within the project area. Their preferred habitat is cold water streams but they can survive at a wide variety of elevations, habitats, and temperature regimes. While they prefer cold water, redband trout has evolved to be able to withstand warm water temperatures of up to 28°C (82.4ºF) for short periods of time (Hillman et al. 1999).

Speckled Dace
Speckled dace is widespread across the United States, and is distributed throughout a large portion of the project area. This species lives in a variety of habitats, but normally prefers shallow, cool and slower moving waters.

Redside Shiner
Redside shiner is native to several western states including WA, OR, ID, MT, UT, NV, and WY. The species occupies a wide variety of habitats including lakes, streams, ponds, and irrigation ditches, preferring areas where the current is slow or absent.

Bridgelip Sucker
This sucker species is widely distributed in all major tributaries to the Owyhee, Bruneau, and Snake Rivers. Preferred habitat for bridgelip sucker is small, fast-flowing cold water streams with gravelly, rocky bottoms; although it may also inhabit rivers where current is moderate and substrate is composed of sand and silt.

Chiselmouth
A widely distributed member of the minnow family, it inhabits moderate to slow-flowing streams of all sizes, and can be found in lakes. Spawning occurs in streams over gravel or small rubble. Species distribution includes all major tributaries to the Owyhee, Bruneau, and Snake Rivers.

Longnose Dace
Longnose dace is widespread across the United States, and is distributed throughout a large portion of the project area. They prefer the riffle areas of streams, but can be found along the shoreline of lakes where the substrate is composed of small rubble. Longnose dace are a benthic species, living among the stones on the bottoms of streams.

Others

Other species recorded in the project area include: brook trout, smallmouth bass, largescale sucker, mottled sculpin, mountain sucker, northern pikeminnow, Paiute sculpin, and rainbow trout (hatchery reared rainbow trout were formerly stocked in several streams).Eleven fish species have been introduced to streams or reservoirs over the last 100 years, though most are restricted in distribution to the Snake River which is outside of the project area boundary. However, smallmouth bass were introduced into and are now widely distributed in the Owyhee River basin.

3.7.2 Environmental Consequences – Fisheries

Effects to fish and fish habitat resulting from juniper expansion are primarily a reflection of elevated levels of fine sediment, loss of habitat complexity, effects to stream flows (loss of perennial flows and higher peak flows), altered nutrient cycling, and higher water temperature.

Since Great Basin redband trout is the most widespread fish species in the Project Area, for the purposes of this analysis it has been treated as the species to represent effects to fish habitat in general. Therefore, beneficial, neutral or adverse effects to riparian functioning condition are assumed to affect different species more or less equally. Rieman et al. in a 1995 study (in Boise National Forest) determined redband trout appear to be well-adapted to disturbance such as large-scale, high-intensity wildfire. The authors described fire events as “pulsed disturbance” with effects that may be considered adverse but limited in time as opposed to chronic “press” disturbance such as poorly-built roads that are a continuous source of fine sediment input. Just as poorly built roads, the effects of juniper encroachment and the negative impacts to the aquatic system represent a “press” disturbance, to which redband trout are not well adapted.

Treatment of juniper in riparian areas, which is a pulse type of disturbance, may lead to short-term increases in water temperature over 1 to 3 years. However, temperatures are not expected to be increased to a point that they would negatively impact redband trout because redband trout have evolved to tolerate high water temperatures and riparian vegetation would be expected to quickly respond to removal of juniper.

3.7.2.1 Alternative A – No Action

Fish habitat within the project area would continue to be degraded into the foreseeable future as juniper establishment increases as described above in Sections 3.6.1 and 3.6.2. The amount of bare interspace between trees would increase and lead to greater amounts of overland flow and fine sediment input into stream channels. Bank instability would increase where juniper establishes along streams and habitat complexity would be reduced.

The short-term effects (1-3 years) of stream sedimentation include degradation of fish habitat due to changes in preferred habitat structure (reduced cover, decreased pool depth, changes in pool/riffle structure, clean substrate for spawning, etc.) and a reduction in available prey (macroinvertebrates) as organic matter is reduced or macroinvertebrate habitat is covered by fine sediment. Foreseeable long-term effects (10+ years) include a chronic breakdown of stream structure and habitat as described for short-term effects.

Loss of desired riparian vegetation would also affect in-stream nutrient cycling. As juniper dominates riparian corridors, biological input will convert from one dominated by deciduous and herbaceous species to one dominated by juniper leaf litter (Miller et al. 2005).While total nutrient input may not decline, nutrient input from juniper leaf litter could reduce forage quality for macroinvertebrates. This could cause a shift in diversity and density of aquatic macroinvertebrates. In addition, terrestrial invertebrates such as worms, beetles, and grasshoppers, which can be an important food source for fish during certain times of year, would be less prevalent in juniper dominated riparian areas due to drier soils and less herbaceous vegetation.

Furthermore, when juniper woodlands develop, the likelihood of catastrophic fire increases. Since shrubs, grasses, and forbs are reduced or absent in juniper woodlands, recovery of vegetation can take several years and this makes the area more susceptible to erosion and degradation of streams. Such impacts could negatively impact fish habitat for decades. This alternative would not meet the intent of INFISH.

3.7.2.2 Alternative B – Treatment Including Wilderness

With implementation of this alternative, the reduction of juniper throughout the project area would improve conditions in both the uplands and riparian areas. In general, the outcome of treating juniper would be the opposite of the effects describe for the No Action Alternative. Upland and riparian conditions would improve and lead to greater vegetation cover by desirable riparian species which would reduce overland flow, fine sediment input into streams and bank instability. There may be a short-term increase or pulse disturbance in temperature, but preferred riparian vegetation would recolonize and stabilize banks and bare soil areas. Other short-term effects (1-5 years) of juniper removal include establishment and an increase in desirable riparian vegetation, bank stabilization, and reduced input of fine sediment (Rosenberger et al. 2015; Beschta 1997).

As riparian vegetation increases over the mid to long term (5+ years), banks would continue to stabilize and overall amount of bare ground will be reduced. This decrease in bare ground and increase in riparian vegetation would reduce sedimentation into stream channels by dissipating energy from runoff and capturing fine sediment (Miller et al. 2005). Habitat conditions for fish would improve as streams stabilize and provide a variety of stream structure such as pools, undercut banks, riffles, and runs. As desirable vegetation such as willow, cottonwood, alders and herbaceous riparian vegetation establish, conditions for macro-invertebrates and terrestrial invertebrates would improve, which would enhance the prey base for redband trout. Riparian vegetation also holds water in the soil, which gets released slowly throughout the year. This supply of water is especially important during summer months. Maintaining and improving upland and riparian conditions would improve habitat conditions for redband trout and meet the intent of INFISH.

3.7.2.3 Alternative C – No Treatment in Wilderness

Effects to fisheries outside of wilderness would be the same as those described for Alternative B and would meet the intent of INFISH. Within the 31,000 acres of wilderness, only a few miles (less than 3 miles) of fish-bearing streams would not be treated. These include small segments of East and West Fork Shoofly Creek and its tributary Snow Creek as well as a small portion of Poison Creek. Fisheries within the wilderness areas would undergo impacts similar to those described for Alternative A. Fine sediment loads would continue to increase, unmitigated, as

riparian areas converted to juniper woodlands. Overall in-stream habitat would likely have a chronic reduction in complexity, an impaired nutrient cycle, and a decreased prey base in untreated wilderness areas (Miller et al. 2005). These effects would impact areas outside of wilderness as sediment moves downstream through the system.

3.7.2.4 Alternative C1 – Preferred Alternative

In general, the effects of this alternative would be opposite of those described for Alternative A and the same as those described for Alternative B, except more area would be treated. Fish habitat within the project area would improve as the effects of juniper encroachment were reduced through the project area. The amount of bare interspace that currently exist between trees would be replaced with shrub steppe vegetation. This would decrease overland flow and input of fine sediment into stream channels. Bank stability would increase where juniper is removed from streambanks as desirable riparian vegetation became established where juniper had been.

Reducing juniper in riparian areas would result in changes to the riparian vegetation community, including an increase of preferred trees, shrubs, and herbaceous vegetation (Miller et al. 2005). This increase of desirable riparian species diversity would maintain and improve the function of the basic ecological processes associated with healthy riparian areas, including water quality, maintenance of base flows, nutrient cycling and energy flow.

Riparian woody species such as willows, alders, and cottonwoods produce rhizomatous root structures that help stabilize streambanks and reduce sediment input into streams. As shrub steppe vegetation becomes established where juniper were previously, the amount of bare ground will decrease in the uplands and along the riparian corridors, reducing runoff and erosion rates (Pierson et al. 2007; Bisson et al. 2003; Robinson et al. 2010; Pierson et al. 2010). This decrease in runoff and erosion would reduce fine and course sediment loads in stream channels and lead to more desirable conditions for fish (i.e., increased pool depth due to reduced fine sediment input).

While there may be a short-term effects (1-3 years) of stream sedimentation there would be long-term benefits. The long-term benefits of juniper removal include improved conditions to fish and fish habitat from development of preferred habitat conditions such as increased cover, increased pool depth, and clean substrate for spawning. Conditions would also improve for macroinvertebrates. This alternative would meet the intent of INFISH.

3.7.3 Cumulative Impacts – Fisheries

3.7.3.1 Scope of Analysis

The spatial scope of the cumulative impacts analysis for fisheries resources includes project area watersheds to their confluence with the Snake River or Owyhee Reservoir. This analysis area was determined because the effects of project implementation of the preferred alternative would not be measurable at those points. No negative cumulative effects would occur from implementation of the preferred alternative due to the light-handed approach being proposed for juniper treatment. Watersheds within this area contain similar landscape features, riparian vegetation components, and land uses. Primary resource concerns include the reduction in sagebrush steppe and riparian

vegetation, runoff and erosion, and sediment input into stream channels. While the direct effects from this proposed project are expected to be localized in nature (as described in section 3.7.2) the effects from other present and reasonably foreseeable future actions overlap within these watersheds.

The temporal frames for cumulative impacts are identical to those described in the fisheries section above. Direct and indirect impacts to fish and fish habitat would be short in duration (1-3 years) as riparian vegetation re-establishes. Overall improvements to habitat complexity and availability would likely occur within 5-10 years after treatment.

3.7.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

In the project area, irrigation diversions, livestock grazing, road construction and historic mining have combined to reduce stream flows and alter stream channels and riparian communities on many streams in the project area impacting fish habitat. In the Jordan Creek/Boulder Creek drainage, primary land management impacts include historic mining, livestock grazing, and, more recently, outdoor recreation. These activities impact fish-bearing streams in a variety of ways including utilization of riparian vegetation by livestock which results in a reduction in vegetation that can dissipate energy during overland flow events, in-channel dredging or development of tailing piles that alter stream channels and/or increase sedimentation, the development of roads, camping areas and other anthropogenic alterations associated with recreation use that increase sedimentation (roads and camping areas) and altered stream channels (placement of rock barriers to create pool areas, trail or road crossings, etc.).

Juniper treatments have been ongoing and are targeted at reducing juniper throughout sagebrush steppe habitat. These projects include South Mountain, Trout Springs and Pole Creek. South Mountain is a prescribed fire as part of an experiment of the effect of juniper on watershed function being completed by the local Agriculture Research Station. Trout Creek and Pole Creek are juniper removal projects whose primary focus is to improve sagebrush steppe conditions that would benefit wildlife. All projects will use a combination of mechanical juniper removal and prescribed fire to achieve their respective project goals.

Wildfire is a phenomenon that occurs both naturally and as the result of human ignition throughout the Boise District and within the proposed project area. Large fire complexes include the 2015 Soda Fire which burned approximately 182,000 acres of the project area, the 2012 Jacks Fire (approximately 50,000 acres), and 2012 Tongue Complex (approximately 47,000 acres).

3.7.3.3 Alternative A – Cumulative Impacts

Past, present and reasonably foreseeable future actions within the project area would continue to have varying degrees of impacts on fisheries resources. Roads, recreation activities, wildfire, water diversions, grazing, and mining activities would continue throughout the project area and likely result in reduced vegetative cover in riparian areas, increased sedimentation, and changes to water quality (temperature). Where mitigation can be implemented on future projects, effects would be minimal. However, adverse effects such as chronic (persistent and lasting) sediment input, elevated water temperature and altered nutrient balance move downstream through aquatic

systems. The potential for cumulative effects to fish habitat and fish populations, especially in the downstream portions of watersheds, would increase over time as upland and riparian areas are further degraded from juniper encroachment. Cumulatively, these impacts would reduce the overall quality, complexity, and quantity of habitat available to fish and macroinvertebrate communities in the long term.

3.7.3.4 Alternative B – Cumulative Impacts

Fish and fish habitat would benefit from implementation of juniper treatment and there would be no cumulative negative impacts. Conditions would improve throughout the analysis area including areas downstream of the project boundary. As preferred riparian vegetation re-establishes in treatment areas, sediment input would be reduced, habitat complexity would increase and bank stability would improve. Short-term impacts to fisheries within the project area would be minor with long-term benefits leading to increased habitat availability at a local and cumulative effects analysis area scale.

Past, present and reasonably foreseeable future actions within the project area would continue to have varying degrees of impacts on fisheries resources. Roads, recreation activities, wildfire, water diversions, grazing, and mining activities would continue throughout the project area and likely increase sedimentation, reduce vegetative cover in riparian areas, and change water quality (temperature). However, these effects would not be cumulative with the implementation of juniper treatment.

3.7.3.5 Alternative C – Cumulative Impacts

Fish habitat located outside of wilderness areas would have similar cumulative impacts as identified for Alternative B. Areas within Wilderness would have cumulative impacts similar to those described for Alternative A.

3.7.3.6 Alternative C1 – Cumulative Impacts

Juniper treatment across the larger project area proposed with Alternative C1 would produce beneficial impacts to fish and fish habitat throughout the project and cumulative effects analysis area. There would be no negative cumulative impacts from implementation of the preferred alternative with past, present, and foreseeable actions. This is because conditions would improve within the treatment area.

3.8 Wilderness

3.8.1 Affected Environment – Wilderness and Visual Resource Management

Wilderness

The proposed project area includes portions of five wildernesses: Big Jacks, Little Jacks, North Fork Owyhee, Owyhee River, and Pole Creek (Map 19). Regulations administering management of wilderness areas specify that they be managed in a manner that preserves and protects wilderness characteristics and values per BLM Manual 8560 [Sec .08 (A) (1)], which include naturalness and outstanding opportunities for solitude and/or primitive and unconfined recreation. Wilderness values include solitude, naturalness, opportunities for primitive and unconfined recreation, and the presence of special features that enhance wilderness values.

Big Jacks Wilderness
The Big Jacks Wilderness includes approximately 52,684 acres; roughly 2,980 acres of the wilderness fall within the focal treatment area. The area consists of deep canyons, streams, and uplands that provide habitat for several sensitive species, including greater sage-grouse, bighorn sheep, and redband trout. The wilderness also contains four wild river segments: Big Jacks, Wickahoney, Duncan, and Cottonwood creeks. The Big Jacks Wilderness is home to Parker Trail, which provides non-motorized recreational access from the eastern wilderness boundary to Big Jacks Creek Canyon.

Little Jacks Wilderness
The Little Jacks Wilderness includes approximately 51,491acres; roughly 7,800 acres of the wilderness fall within the focal treatment area. The area is popular for hiking, backpacking, angling, and nature observation. The Little Jacks Wilderness is the closest BLM wilderness to Boise ID, and the urban areas of the Treasure Valley in southwest ID. Therefore, this wilderness area receives a higher volume of recreational use than the other wilderness areas.

North Fork Owyhee Wilderness
The North Fork Owyhee Wilderness includes approximately 43,413 acres; roughly 9,400 acres lie within the focal treatment area. The wilderness area consists of rugged juniper hills and a flat plateau dissected by numerous canyons. Approximately 15 miles of the North Fork Owyhee River meanders through this wilderness and is designated as a “wild” river. Special features recognized for the North Fork Owyhee Wilderness include exceptional scenic quality because of its spectacular sheer-walled canyons and rock outcrops highlighted with gnarled juniper. Sensitive wildlife species are also included as special features in the wilderness area (USDI BLM 1991).

Owyhee River Wilderness
The Owyhee River Wilderness includes approximately 267,328 acres; roughly 4,000 acres lie within the focal treatment area and are proposed for juniper treatment. This wilderness area consists of a flat desert shrub expanse that lies on a moderately eroded tableland. The wilderness is centered on the Owyhee River and its tributaries in the southwest portion of Idaho near the Oregon border. The land is defined by rivers cutting steep canyons out of high-desert sagebrush plateaus. The wilderness area provides good habitat for greater sage-grouse, bighorn sheep, and several other sagebrush obligate species. The Owyhee River Wilderness contains naturalness, outstanding opportunities for solitude due to excellent topographic and vegetative screening, outstanding opportunities for primitive and unconfined recreation, and supplemental values such as scenic, scientific, wildlife, and cultural values. It contains six wild river segments: the Owyhee and South Fork Owyhee rivers, Battle, Deep, Dickshooter, and Red Canyon creeks. The Owyhee River Wilderness also has 11 cherrystem routes, 5 of which cross through the wilderness, splitting it into six subunits.

Pole Creek Wilderness
The Pole Creek Wilderness includes roughly 12,530 acres. The majority of this wilderness area is proposed for treatment with approximately 900 acres lying outside of the treatment area. The only direct public access to the Pole Creek Wilderness is from Mud Flat Road, which forms the

wilderness boundary along its northwest corner. Other access routes are across private land and require landowner permission.
The Pole Creek Wilderness contains historic, cultural, scenic, and wildlife values, but contains no wild and scenic river segments. Many of the historic sites are associated with early homesteading and Basque settlement. The wilderness incorporates portions of the Camas and Pole Creeks Archaeological District, which is listed on the National Register of Historic Places. The area supports various sensitive species, including populations of Columbia spotted frog, greater sage-grouse, migratory birds, Mudflat milkvetch, and Bacigalupi's downingia.

Lands with Wilderness Characteristics
Because there are no proposed improvements or any new construction within these areas, and because these lands would be negligibly affected or unaffected by the proposed project, lands with wilderness characteristics will not be analyzed in this document.

Visual Resource Management
The visual resource management (VRM) classes within the proposed project area consist of I, II, III, and IV (Table 25, Map 19). The Class I designation has the most protections and Class IV has the least. The majority of the project area is VRM class IV, followed by VRM class III, class II, and class I in order of abundance. Areas containing VRM class I consist primarily of the wilderness areas identified within this project area, as well as an area within Nickel Creek Canyon (Map 19).

Table 25 – Visual Resource Management classes and acres of each in the proposed project area.

VRM Class[1]	Acres in Project Area	Portion of Project Area
I	185,200	12%
II	277,100	18%
III	284,100	19%
IV	791,000	51%

[1]VRM class management objectives are described fully in the ORMP (USDI BLM 1999)

3.8.2 Environmental Consequences – Wilderness and Visual Resource Management
Table 26 summarizes acres and proportions of the action alternatives' focal treatment area for each VRM Class.

Table 26 – Acres and proportion of focal treatment areas in each VRM Class by action alternative.

VRM Class	Alt B FTA acres (%)	Alt C FTA acres (%)	Alt C1 FTA acres (%)
I	30,400 (4%)	7,400 (1%)	7,500 (1%)
II	118,600 (17%)	112,300 (17%)	121,200 (17%)
III	164,100 (24%)	164,000 (25%)	204,800 (28%)
IV	370,200 (54%)	368,600 (57%)	391,300 (54%)

3.8.2.1 Alternative A – No Action
Wilderness
There would be no direct or indirect impacts to wilderness values such as untrammeled, undeveloped, natural, and primitive recreation under this alternative. The continued

encroachment of juniper would provide some minor benefits to the wilderness area over the next 10+ years by increasing the areas vegetative screening, thus allowing more opportunities for solitude.

Impacts to other wilderness features such as wildlife would be negatively affected with the no action alternative. Juniper would continue to expand into essential habitat for sage-grouse (i.e., lekking, nesting, and brood rearing habitat). In the long term (10+ years), these habitats would be degraded to the point that they are no longer suitable for sage-grouse. Further loss of habitat would have a negative impact on other sagebrush obligate species and species closely associated with sagebrush habitat (see section 3.5 for details).

Visual Resource Management

Visual resources would remain in their current state, as landscape scale treatment of encroaching juniper would not occur. Over time, open areas and scenic vistas may be lost to juniper encroachment; however, this change in landscape may appeal to those that desire a densely populated forest.

3.8.2.2 Alternative B – Treatment Including Wilderness

Wilderness

Approximately 37,000 acres (9%) of the 427,500 acres of wilderness in the vicinity would be treated with implementation of Alternative B

Minimum Requirements Decision Guide

A Minimum Requirements Decision Guide (MRDG) was used to evaluate the proposed treatment within wilderness. The evaluation compared three different alternatives for juniper treatment within wilderness: one using non-motorized non-mechanized equipment, one using motorized, and the third alternative utilizing prescribed fire. Alternative 1 proposes the following for juniper treatments was found to be the least impacting to wilderness; however, it should be noted that all alternatives received a negative grade on wilderness character:

1. Only hand saws would be used;
2. Access to trees would be on foot only (all vehicles would be restricted to designated roads and trails);
3. Only trees ≤8-inches diameter at breast height (DBH) would be treated; and
4. Only trees in the early stages of encroachment (roughly 10% cover) would be treated (see Design Features, section 2.2.5). The 8-inch DBH criterion was assigned because treatment of juniper with hand tools becomes too difficult when the DBH is greater than 8 inches.

Site Specific Impacts

Juniper treatment within portions of the wilderness areas would have a negative impact to the wilderness areas' untrammeled and undeveloped characteristics by creating a "modern human control" through vegetation manipulation. The project would also impact the immediate areas' naturalness by leaving an imprint of human work within the wilderness areas. The project work may be noticeable for several years as trees deteriorate, however; this impact would be minor

because it would only be noticeable to those within the direct vicinity of the treatment and because the project occurs within such a small portion (roughly 9%) of the wilderness areas. Conversely, in the long term, the project would benefit the areas naturalness by aiding in the restoration of the sage brush component, which is a unique value for wilderness areas.

Removal of juniper would reduce vegetative screening within early phase stands to a minor degree. However, outstanding opportunities for solitude would still exist due to the excellent topographic screening of the wilderness areas, river corridors, and the more encroached juniper stands in the project vicinity. Short-term impacts may also occur during actual treatment operations while crews are working in the area, potentially reducing visitor opportunities for solitude; however, these impacts would be temporary – during treatment work only – and negligible.

Impacts from the treatment would be mitigated to some extent by utilizing the minimum tool (handsaws only), conducting work within wilderness on foot, treating early stage juniper with less than 10% canopy cover, and only removing trees with less than 8-inch DBH within wilderness.

Unique features such as sage-grouse and suitable sage-grouse habitat identified in the designation of these wilderness areas would benefit from implementation of the proposed project. Juniper treatments would improve riparian and vegetative health conditions throughout the area, restoring existing shrub steppe, aspen and riparian communities, thus restoring, improving, and maintaining suitable sage-grouse habitat within the wilderness areas for years to come.

Visual Resource Management

The proposed treatments would occur within all VRM classes (I, II, III and IV); however, the vast majority (roughly 78%) would be in VRM classes III and IV (Table 26). The effects of juniper treatments on visual resources would be somewhat subjective (some may prefer densely populated juniper forests, while others may desire open areas and scenic vistas). With the proposed treatment, the BLM would achieve both while simultaneously accomplishing management objectives and improving greater sage-grouse habitat throughout the area.

Juniper treatments would have wide-ranging effects on visual resources. Juniper treatments would focus primarily on early stage juniper with less than 20% canopy cover, which would have a beneficial long-term effect on visual quality as scenic vistas open up and aspen, perennial grasses, and other vegetation increase. Additionally, retaining later stage, more established juniper, including old growth juniper and mahogany stands, would assist in maintaining the current scenic quality throughout the area.

Effects to visual resources during juniper treatments would be evident for several years. Shearing, mastication, and hand-cutting in areas that are not piled and burned after the fact would create the most noticeable effects. Downed junipers scattered across the landscape would be noticeable for several years, and some would be apparent for the foreseeable future. Visual effects of the cut trees would be reduced somewhat by flush cutting, and lopping and scattering

the trunk and branches. In areas where downed materials are burned, these effects would end after burning and once perennial grasses recover.

Jackpot and pile burning would have short-term effects on the visual resources within the project area. After burning, fire-blackened areas and dead vegetation would be noticeable for several years. Visitors within the immediate area would see charred to partially charred tree skeletons and blackened earth and rock. However, visual effects would improve over time after grasses and shrubs begin to reestablish (1 to 3 years for herbaceous vegetation and up to 10 years for shrubs). The use of fire in the vegetation treatments would give the area a more natural appearance. In the long term, jackpot and/or pile burning would improve the overall health and scenic quality of the area.

Treatment areas within VRM class I, which are predominately wilderness, would result in a negligible to minor change to the landscape. VRM class I "…provides for natural ecological changes, but it does not preclude very limited management activity. The level of change to the characteristic of the landscape should be very low." With the project in limited areas of VRM class I, the utilization of treatment methods such as non-motorized equipment, hand tools, cutting trees flush with ground surface, and only removing trees under 8-inches DBH, would help minimize the impacts to the wilderness landscape (per the MRDG). Impacts would be greater and more evident with downed trees in the short term; however in the long term, as trees expire and perennial grasses and sage recover, impacts to visual resources would be minor and would provide more opportunities for scenic vistas within the area as the landscape opens up.

Off-road travel to access treatment areas outside of wilderness could lead to the establishment of new routes which would adversely impact visual resources throughout the area as new disturbances are created. However, best management practices and design features specific to vehicle travel (sections 2.2.4 and 2.2.5) would minimize or eliminate these impacts.

3.8.2.3 Alternative C – No Treatment in Wilderness

Wilderness

Impacts to wilderness would be to the same as those discussed in Alternative A because no treatments would occur in wilderness.

Visual Resource Management

Impacts to visual resources would be nearly identical to those discussed for Alternative B. Roughly 82% of treatments are proposed in VRM Class III and IV areas (Table 26). Slightly more of the treatments would occur in VRM Class IV under this alternative (57% versus 54%) and slightly fewer would occur in VRM Class I (1% versus 4%); however, the difference in impacts would be negligible.

3.8.2.4 Alternative C1 – Preferred Alternative

Wilderness

No wilderness would be treated under this alternative, so impacts to wilderness would be identical to those discussed in Alternative A.

Visual Resource Management

Impacts to visual resources would be nearly identical to those discussed for Alternative B, as proportions of treatments in each VRM Class are nearly identical between the alternatives. Roughly 82% of treatments are proposed in VRM Class III and IV areas, 17% of treatments are proposed in VRM Class II areas, and 1% in Class I areas (Table 26).

3.8.3 Cumulative Impacts – Wilderness

3.8.3.1 Scope of Analysis

The area of analysis for cumulative effects is the 1.67 million-acre proposed project area plus the extent of the five designated wilderness areas (Big Jacks, Little Jacks, North Fork Owyhee, Owyhee River, and Pole Creek) within the two field offices. The timeframe considered is from the implementation of the OPLMA (2009) for current conditions and activities planned within the next three years, and the expected duration of effects from those activities (generally 10 to 20 years). The geographic and temporal cumulative impact analysis scope for VRM resources is the same as for Wilderness.

3.8.3.2 Current Conditions and Past, Present and Reasonably Foreseeable Future Actions

Current conditions of the wilderness areas are as described in the affected environment (section 3.9.1). The five wilderness areas spanning the project area offer a multitude of experiences for visitors ranging from wildlife viewing, camping, backpacking, hunting, fishing, and boating to name a few. Mountains, valleys, tablelands, and deep scenic canyons are just part of the make-up of these recently designated areas. Many of these canyons, streams, and upland plateaus provide key habitat for several BLM special status species, including greater sage-grouse, bighorn sheep, and redband trout.

Cumulative effects to wilderness in the analysis area would primarily be the result of livestock grazing, wildfire, future vegetation treatment projects such as broadcast burning in surrounding areas, and current and future actions that stem from the OPLMA. The passing of the Act designated roughly 517,000 acres of wilderness and 316 miles of wild and scenic rivers within Owyhee County. In addition, the Act also mandates the BLM to complete a transportation plan for all of Owyhee County.

3.8.3.3 Alternative A – Cumulative Impacts

Wilderness

Cumulatively, other wilderness features (namely wildlife) are the most likely to be impacted. Sage-grouse habitat within wilderness will continue to be encroached upon by juniper and the area eventually would not provide suitable habitat. Further loss of habitat would put sage-grouse at greater risk. Conversely, the continued encroachment of juniper would be beneficial to the wilderness areas solitude over the years, by increasing vegetative screening, and allowing more opportunities for solitude. There would be no impacts to wilderness character such as untrammeled, undeveloped, natural, and primitive recreation.

Impacts outside of the wilderness areas as a result of juniper treatment projects, travel management planning, and improved grazing operations would be beneficial to the area as a

whole. These actions would have negligible impacts to wilderness itself as most occur outside of these designated areas.

Visual Resource Management

Alternative A would not contribute to cumulative impacts to visual resources. Visual resources would remain in their current state.

3.8.3.4 Alternative B – Cumulative Impacts

Wilderness

Wilderness would be affected in the same manner and to the same degree by the actions discussed above. Cumulative impacts would be greater than Alternative A but would, overall, be minor, particularly since juniper treatments proposed in wilderness under Alternative B (31,000 acres) would be accomplished on foot and with hand tools. Sage-grouse habitat in those 31,000 acres would be improved over the long term compared to alternatives A, C, and C1. Additionally, the impacts of this alternative, when combined with those actions outside of the wilderness areas would be beneficial to the analysis area as a whole.

Visual Resource Management

Proposed juniper treatments would have minor effects on visual resources in the cumulative effects analysis area. Other juniper treatment projects would also have some minor effects on visual resources. Under these projects, an estimated 50 to 70% reduction in seral junipers would have a long-term effect on visual quality as scenic vistas open up and aspen, perennial grasses, and other vegetation increase as a result of juniper removal. Additionally, retaining 30 to 50% of the existing juniper, as well as old growth juniper and mahogany stands, would remain and assist in maintaining the scenic quality throughout the area.

Burning associated with the multiple juniper treatment projects throughout the analysis area would have short-term effects on the visual resources within the project area. Once burning operations are complete, fire-blackened areas and dead vegetation would be noticeable for several years. In the long term, burning would improve the overall health and scenic quality of the area.

Class I visual resources, which are predominately within wilderness, would only be impacted by the proposed juniper treatment project. Other projects identified within the cumulative analysis area are outside of wilderness, and would have no impact within these areas.

Cumulatively, the impact of the past, present, and future projects would be minor when considering the analysis area as a whole. The analysis area is composed of such rugged terrain and abundant vegetation that most projects are screened and only visible to visitors within the immediate area of the project. In the long term, the combined effects of juniper treatment projects, designation of wilderness areas, wild and scenic rivers, travel management planning, and improved grazing management within the cumulative analysis area would be beneficial to the overall health and scenic quality of the area.

3.8.3.5 Alternative C and C1 – Cumulative Impacts

Wilderness

Cumulative impacts associated with these alternatives would be identical to those discussed in Alternative A.

Visual Resource Management
Impacts to visual resources would be similar to those discussed under Alternative B, with the exception of those items related to wilderness and VRM class I areas which would not be impacted under these alternatives.

3.9 Areas of Critical Environmental Concern

3.9.1 Affected Environment – Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACECs) are areas where special management attention is provided to protect important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect human life and safety from natural hazards. The proposed project area contains all or portions of nine ACECs: Coal Mine Basin, Cottonwood Creek, McBride Creek, Sommercamp Butte, Boulder Creek, North Fork Juniper Woodland, The Badlands, Pleasant Valley Table, and Owyhee River Bighorn Sheep (Map 20, Table 27). Juniper cutting and/or burning is only permitted in four of the ACECs per management direction in the Owyhee RMP and Bruneau MFP: Coal Mine Basin, Cottonwood Creek, McBride Creek, and Sommercamp Butte.

Table 27 presents the acres that fall within the project area as a whole and those within the focal treatment area (acres are identical for all action alternatives), as well as a general summary of ACEC values. Of the nine ACECs, three were burned in the 2015 Soda Fire (Coal Mine Basin, McBride Creek, and Sommercamp Butte), and three ACECs occur entirely or almost entirely in designated wilderness (Cottonwood Creek, North Fork Juniper Woodland, and Owyhee River Bighorn Sheep).

Table 27 – ACECs within the project area.

ACEC	Total Acres	General Summary of Values[1]	Juniper Cut/Burn (per RMP)
Coal Mine Basin[2] (OFO)	Total: 2,397 Project area: 1,605 Treatment area: 1,130	*Colorful ash beds *Diverse plant communities (including mountain mahogany) *Special status plants *Fossils *Diversity of wildlife	Permitted
Cottonwood Creek[3] (BFO)	Total: 346 Project area: 326 Treatment area: 0	*Redband trout habitat	Permitted

ACEC	Total Acres	General Summary of Values[1]	Juniper Cut/Burn (per RMP)
McBride Creek[2] (OFO)	Total: 262 Project area: 262 Treatment area: 27	*Special status plants *Volcanic ash flows	Permitted
Sommercamp Butte[2] (OFO)	Total: 440 Project area: 440 Treatment area: 440	*Mountain mahogany-bluebunch wheatgrass and oceanspray communities *Scenic *Special status animals *Diversity of wildlife	Permitted
Boulder Creek (OFO)	Total: 6,987 Project area: 6,978 Treatment area: 0	*Scenic canyon *Special status animals *Diversity of wildlife	Prohibited
North Fork Juniper Woodland[3] (OFO)	Total: 4,412 Project area: 1,076 Treatment area: 0	*Best example of "montane western juniper woodland subtheme" dominated by stands of old growth juniper *Special status animals *Diversity of wildlife	Prohibited
Owyhee River Bighorn Sheep[3] (OFO/BFO)	Total: 201,051 Project area: 105,396 Treatment area: 0	*Bighorn sheep habitat *Other special status animals *Scenic river canyons	Prohibited
Pleasant Valley Table[3] (OFO)	Total: 1,467 Project area: 1,467 Treatment area: 0	*Excellent Owyhee sagebrush-Sandberg bluegrass and low sagebrush-Idaho fescue communities *Rare silver sagebrush community *Special status animals *Diversity of wildlife	Prohibited
The Badlands (OFO)	Total: 1,835 Project area: 1,833 Treatment area: 0	*Scenic *Diverse botanical features *Special status animals *Diversity of wildlife	Prohibited

[1]Summary of the general resource values identified for each ACEC in their respective land use plans (Owyhee RMP and Bruneau MFP). Each of these resources (e.g., special status plants and animals, cultural sites, etc.), and their occurrences, are captured and described in detail in their respective resource sections of this EIS (i.e., Special Status Plants, Wildlife/Special Status Animals, Fisheries, Wilderness, Visual Resource Management, and Cultural and Paleontological Resources.

[2] ACECs within 2015 Soda Fire boundary.

[3] The portions of these ACECs within the project area are entirely or almost entirely within designated wilderness.

3.9.2 Environmental Consequences – ACECs

3.9.2.1 Alternative A – No Action

No juniper treatments would occur, so no values within ACECs would be directly impacted, either positively or negatively. However, without removal of juniper in the focal treatment areas, ACEC values for unique vegetation, special status plants and animals, wildlife, scenic values, and fossils or cultural sites could continue to be degraded due to further and ongoing juniper encroachment as discussed in Sections 3.2 Vegetation, 3.3 Special Status Plants, 3.5 Wildlife/Special Status Animals, 3.10 Recreation and Visual Resources, and 3.11 Cultural Resources. Over the long term (10+ years), impacts to resource values, such as sage-grouse habitat, intact sagebrush communities, other wildlife habitats, and special status plants, would be negatively affected with the no action alternative as juniper continues to expand into the sagebrush steppe.

3.9.2.2 Alternative B – Treatment Including Wilderness

Juniper treatments would occur in Coal Mine Basin, McBride Creek, and Sommercamp Butte ACEC affecting approximately 1,600 acres total (<1% of the total acres of ACEC spanning the project area). Treatments could occur in Cottonwood Creek ACEC under this alternative as it is within the project area; however, it is not within the focal treatment area, so juniper treatments there are not anticipated. The ACEC values for unique vegetation, special status plants and animals, wildlife, scenic values, and fossils or cultural sites could experience minor short-term adverse impacts from various treatment activities, but the design features (section 2.2.5) developed for the various resource values contained in these ACEC would limit impacts.

Where juniper treatments occur, overall sagebrush habitat would improve in the short and longer term. However, the five ACEC where juniper treatments are prohibited (but meet the juniper/sagebrush cover model defining the focal treatment area) (56,508 acres) plus the Cottonwood Creek ACEC could continue to be degraded due to further and ongoing juniper encroachment similar to the No Action alternative (Alternative A) and as discussed in sections 3.2 Vegetation, 3.3 Special Status Plants, 3.5 Wildlife/Special Status Animals, 3.10 Recreation and Visual Resources, and 3.11 Cultural and Paleontological Resources.

3.9.2.3 Alternative C – No Treatment in Wilderness

Juniper treatments in and around ACEC would be identical to alternatives B and C1, so impacts to ACEC would also be identical to alternatives B and C1.

3.9.2.4 Alternative C1 – Preferred Alternative

Juniper treatments in and impacts to ACEC would be identical to alternatives B and C.

3.9.3 Cumulative Impacts – ACECs

3.9.3.1 Scope of Analysis

The extent of analysis is the approximately 219,200 acres of ACEC spanning the greater 1.67 million-acre project area. The temporal scope is 30 years for effects from past actions and 15 years for future actions (the timeframe for this project). Since juniper treatments for this project would affect less than 1% of the ACEC, cumulative impacts would be nearly identical for the no action and action alternatives. As such, the cumulative impacts discussion has been combined for all alternatives.

3.9.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Current conditions of ACECs are presented in section 3.9.1, Affected Environment, above. Past, present, and reasonably foreseeable future actions are as presented in sections 3.2 Vegetation, 3.3 Special Status Plants, 3.5 Wildlife/Special Status Animals, 3.8 Wilderness and Visual Resource Management, 3.10 Recreation, and 3.11 Cultural and Paleontological Resources.

3.9.3.3 Alternatives A, B, C, and C1 – Cumulative Impacts

Cumulative impacts would be as discussed in sections 3.2 Vegetation, 3.3 Special Status Plants, 3.5 Wildlife/Special Status Animals, 3.8 Wilderness and Visual Resource Management, 3.10 Recreation, and 3.11 Cultural and Paleontological Resources.

3.10 Recreation

3.10.1 Affected Environment – Recreation

Portions of numerous Special Recreation Management Areas (SRMAs) and the Owyhee Extensive Recreation Management Area (ERMA) lie within the proposed project area (Table 28; Map 21). The SRMAs are designated for special or more intensive types of recreation management because greater investments for recreation management are anticipated due to the intensity of use the area receives (USDA BLM 1999a). An ERMA is an area where recreation management is only one of several management objectives, and where a limited commitment of resources is required to provide extensive and unstructured types of recreation activities (USDI BLM 1999). The SRMAs contain an array of recreation opportunities due to their unique features including canyons, rivers, mountains, geology, wildlife habitat, and trails. Similarly, the ERMA contains diverse landforms providing a wide range of natural settings and recreational opportunities.

Table 28 – Recreation Management Areas, acres, and recreation values in the proposed project area.

Recreation Management Area	Acres in Project Area	Recreation Values
Blackstock SRMA	6,828	Dog trials, hunting, OHV use, hiking, sightseeing, horseback riding, camping
North Fork Backcountry SRMA	14,507	Hunting, camping, fishing, horseback riding, sightseeing, nature study, wilderness

Recreation Management Area	Acres in Project Area	Recreation Values
North Fork Canyon SRMA	475	White water rafting, backpacking, camping, fishing, sightseeing, nature study
Owyhee River Canyon SRMA	24,290	Rafting, backpacking, hunting, camping, rock hounding, sightseeing
Owyhee Front SRMA	175,075	OHV use, mountain biking, hunting, wild horse viewing, horseback riding, rock hounding, camping
Silver City SRMA	581	Historic sights, camping, hunting, fishing, hiking, OHV riding, cross country skiing, snowmobiling
Snake River Birds of Prey SRMA	3,862	Raptor viewing, prehistoric rock art, boating, rafting, fishing, OHV riding, mountain biking, hunting, hiking, horseback riding
Upper Deep Creek & Lower Deep Creek SRMAs	6,341	Hunting ,backpacking, fishing, camping, rafting, sightseeing, nature study
Owyhee ERMA	699,557	Hunting, fishing, horseback riding, rock hounding, nature study, camping, OHV riding, mountain biking, hiking, wilderness, sightseeing

The off-highway motorized vehicle use designations for the proposed project area are "limited to designated roads and trails", "limited to existing roads and trails", and "closed" to motorized/mechanized use. Motorized/mechanized cross-country travel is prohibited on BLM lands within the Owyhee and Bruneau Field Office boundaries. These regulations apply to permitted uses as well as to general public use. Areas identified as "limited to designated roads and trails" are the areas within the Murphy and Wilson Creek subregion travel management areas, which contain roughly 950 miles of designated routes combined. The areas identified as "closed" are within the North Fork Owyhee Wilderness, Owyhee River Wilderness, Pole Creek Wilderness, Big Jacks Wilderness, and Little Jacks Wilderness. The Badlands Resource Natural Area (RNA) and Area of Critical Environmental Concern (ACEC) and the McBride Creek ACEC are also closed to motorized/mechanized travel. The remainder of the area is categorized as "limited to existing roads and trails" in the Owyhee RMP; however, that designation will change "limited to designated roads and trails" within the next 5 years as BLM is currently developing a travel management plans, within Owyhee County, per the OPLMA.

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) classification is used to characterize the type of recreational opportunity settings, activities, and experience opportunities that can be expected in different areas of public land. The proposed project area covers the entire spectrum of settings for recreationists, ranging from primitive (unmodified natural environment), to roaded natural (generally natural with moderate evidence of manmade sights and sounds), to semi-primitive motorized and semi-primitive non-motorized (primarily unmodified natural environment but with evidence of other users), and rural classifications (substantially modified natural environment with moderate to high concentration of users). Overall, recreation is abundant and diverse throughout the proposed project area. The highest recreation use occurs in the northern portion of the project area within the Owyhee Front SRMA, as well as within the Silver City

SRMA. These areas receive a substantial OHV riding, hunting, horseback riding, mountain biking, and wildlife viewing.

3.10.2 Environmental Consequences – Recreation

3.10.2.1 Alternative A – No Action

Recreation opportunities would remain in their current state, as landscape scale treatment of encroaching juniper would not occur. Over time, open areas and scenic vistas may be lost to juniper encroachment; however, this change in landscape may appeal to those that desire a densely populated forest. Additionally, as sage-grouse habitat is lost, so too are hunting opportunities for upland game bird hunters within these areas.

3.10.2.2 Alternative B – Treatment Including Wilderness

Hunting and camping would be the most likely recreational pursuits to be affected during juniper treatment operations. Depending on the time of year cutting and burning operations occur, big game and upland bird hunters, as well as campers, within the treatment areas may experience BLM crews, vehicles, noise, and smoke in the vicinity. Recreationists and sightseers in areas like the Owyhee Backcountry Byway or within wilderness areas could also be affected during operations.

Recreationists who enjoy the wilderness experience may encounter short-term impacts to portions of the wilderness areas naturalness as well as solitude, depending upon the timing of the visit and treatment operations. While there will be no motorized activity within wilderness and only hand cutting operations, visitors may encounter, depending on the timing, a number of BLM crews within wilderness, which would detract from the areas' opportunities for solitude. Cutting operations will also impact the areas naturalness, as visitors come across downed juniper within wilderness. These impacts are somewhat mitigated however, by flush cutting of trees and jackpot burning operations. The size and topography of the wilderness areas, in relationship to the small scale treatment areas within wilderness, will also assist in minimizing the impacts to recreationists.

Impacts to recreationists along the Owyhee Front where the majority of recreational use occurs in the spring season would be negligible. Treatment areas are far enough away from the high density OHV use area that users may only experience light smoke in the distance during burning operations. In the long term (10+ years), juniper treatment operations would be beneficial to the overall health of the area, in turn benefitting hunters, sightseers, and other recreationists. Improved wildlife habitat conditions would increase wildlife viewing opportunities and potentially result in increased hunting success.

3.10.2.3 Alternative C – No Treatment in Wilderness

Impacts to recreation and visual resources would be nearly identical to those discussed for Alternative B, with the exception of those items related to wilderness and VRM class I which would not be impacted under this alternative.

3.10.2.4 Alternative C1 – Preferred Alternative

Impacts to recreation would be nearly identical to those discussed for Alternative B, with the exception of those items related to wilderness which would not be impacted under this alternative.

3.10.3 Cumulative Impacts – Recreation

3.10.3.1 Scope of Analysis

The OPLMA designated roughly 517,000 acres of wilderness and 316 miles of wild and scenic rivers within Owyhee County and directed the BLM to complete a transportation plan for all of Owyhee County. Therefore, the geographic and temporal cumulative impact analysis scope for recreation is the same as for Wilderness.

3.10.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Cumulative effects to recreation and visual resources within the project area would primarily be the result of grazing, wildfire, future vegetation treatment projects. Presently, the main recreational activities within the analysis area include hunting, camping, backpacking, horseback riding, OHV use, fishing, and sightseeing. Visitors to the field offices can also travel the Owyhee Backcountry Byway. The analysis area is home to five designated wilderness areas between the two offices (see section 3.8.1), multiple SRMAs, and one ERMA. Off-highway motor vehicle designations include designated routes, limited to existing routes, and closed routes.

3.10.3.3 Alternative A – Cumulative Impacts

Because few effects are expected from any past, present, or reasonably foreseeable actions, cumulative effects would be negligible. Opportunities for recreational activities in the cumulative analysis area are abundant and would sustain minimal impact. Depending upon timing, access may be limited during the burn treatments from the proposed project, as well as during other juniper treatment projects throughout the analysis area. This would affect the ability of hunters and other recreationists to access some areas. Any proposed range improvements for livestock grazing management within the analysis area, such as fencing, would reduce some opportunities for non-motorized cross-country travel. Travel management planning for all of Owyhee County per OPLMA would improve recreation experiences through trail designation, maintenance, signage, maps, etc.

3.10.3.4 Alternative B – Cumulative Impacts

Cumulative impacts to recreation would be identical to Alternative A.

3.10.3.5 Alternative C and C1 – Cumulative Impacts

Cumulative impacts to recreation would be identical to Alternative A.

3.11 Cultural and Paleontological Resources

3.11.1 Affected Environment – Cultural Resources

Cultural Resources

History

The project area is within the western Snake River Plain of southwestern Idaho in the Northern Great Basin cultural region. Archeological studies throughout the region indicate people have lived in this area for at least 15,000 years before present (Plew 2008). Ethnographically the project area was occupied in the past and today by the Northern Paiute and Northern Shoshone. These people who lived around the Snake River were called Agaidüka (Salmon Eaters) or Yahandüka (ground hog eaters) (Steward 1938, Reprint 1997). Most groups wintered along the Snake River where it was warmer, but families ventured out along Snake River tributaries, which included the Owyhee River, to gather roots, berries, and salmon and other fish. In 1877, President Rutherford B. Hayes established the Duck Valley Indian Reservation. The reservation straddles the Idaho-Nevada state line in Owyhee and Elko Counties.

The first EuroAmericans to travel through southwestern Idaho were fur trappers led by Wilson Price Hunt in 1811 (Hiler 2005), followed by numerous expeditions led by other trappers (Peterson 1995). In 1832, fur trapper Benjamin Bonneville reached the Snake River country and was the first to drive wagons and oxen into the basin (Peterson 1995). In the mid-1830s missionaries began westward migration, traveling along the Snake River on their way to Oregon (Peterson 1995). Over the next 25 years, approximately 50,000 people made the trek on the Oregon Trail through the Snake River Plain heading west. Few, if any, people stayed in southwestern Idaho at that time due to the dry, hot, barren conditions.

The discovery of gold in the Boise Basin and subsequently in the Owyhee Mountains in the early 1860s was the motivation for settlement in southwest Idaho. Predominant mining communities in Owyhee County included Silver City, DeLamar and Flint. Silver City became the County seat in 1866 and remained so until 1934 (Adams 1960). The success of the mining industry was dependent upon a transportation network and associated support for the mines and miners. Eventually smaller communities, ranching, and agricultural areas developed along these roads to support the mining industry. Although there is still some small scale mineral extraction occurring in Owyhee County, ranching has become the main economic industry.

Data and Research

Archeological research and site inventory has been occurring in southwest Idaho since the 1930s. Early work was generally unsystematic and focused on finding large Native American village sites mainly along rivers and major drainages. Mark Plew's (1976 and 1979) archeological investigations in the Camas and Pole Creek drainages during the 1970s provided a prehistoric cultural chronology for the Owyhee uplands. Due to the archeological significance of this area towards our understanding of Native American settlement and subsistence, an approximate 33,220 acre block was designated a NRHP Archaeological District.

Using the larger project boundary of 1.67 million acres, the BLM's records indicate that approximately 749 cultural resource inventories have occurred in the project area since the 1970s, covering roughly 128,028 acres (around 7.7% of the project area). Some of the larger block surveys were completed for fuel reduction projects or for the Idaho Training Range. Otherwise, inventories were completed based on proposed projects such as range improvements, recreation, and mineral prospecting projects. Known cultural sites cover roughly 12,697 acres (<1% of the project area) based on the best available data, including areas of GIS site polygons and site area as documented in site records. In addition, there are approximately 225 miles of

linear sites within the project boundary that include features such as historic roads, trails and water conveyance ditches.

Approximately 2,449 archeological sites have been recorded in the project area; 1,898 are prehistoric, 342 are historic, and 150 are multicomponent, meaning they possess both prehistoric and historic components, and 59 sites cannot be assigned to a category due to lack of dateable objects. Additionally, 1,198 isolated finds, either historic or prehistoric, have been recorded in the project area.

Archaeological districts cover 38,669 acres (2.3%) of the total project area. Two National Register of Historic Places (NRHP) archaeological districts and a small portion of a third district are within the project boundaries. Archaeological districts are areas with significant cultural resources that have been deemed worthy of preservation. They possess "…a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (USDI 1991).

Prehistoric site types include open lithic scatters, stone features such as hunting blinds and rock cairns, rock art and rock shelters. Of the 1,898 prehistoric sites, 23 (1.2%) are listed on the NRHP or are part of a national register archaeological district, 256 (13.5%) have been determined eligible for listing on the NRHP, 265 (14%) have been determined not eligible for listing, and 1,354 (71.3%) have been left unevaluated[9] pending further research (Table 29).

Historic sites include artifact scatters, mining related sites, historic buildings and/or foundations, water features such as conveyance ditches or dams, and rock features such as walls and cairns. Of the known 342 historic sites, 7 (2.1%) are listed on the NRHP or are part of a national register archaeological district, 50 (14.7%) have been determined eligible for listing on the NRHP, 165 (48.4%) have been determined ineligible for listing, and 120 (35.2%) have been left unevaluated pending further research (Table 29). There is also approximately 2 miles of the NRHP eligible South Alternate Oregon Trail on private land within the project boundary. The nearest segment of Oregon Trail to BLM land inside the project area is 0.63 miles away; the nearest Oregon Trail segment outside of the project boundary is 0.12 miles away and about 1.1 miles from the nearest proposed treatment.

Multicomponent sites contain features or artifacts attributed to both prehistoric and historic time periods. One or both of the temporal components may be evaluated as eligible, not eligible or be left unevaluated. A total of 150 multicomponent sites have been recorded with 34 (22.7%) sites eligible for listing on the NRHP, 33 (22%) sites not eligible and 83 (55.3%) sites remain unevaluated.

Sites characterized as "undetermined" are typically features with no diagnostic artifacts from which to date the site and/or do not show up in any historic map or research. These site types are typically rock features or rockshelters with no visible artifacts. Of the 59 sites 8 (14%) were

[9] Unevaluated sites are treated similar to eligible sites until their official significance determination has been made.

determined ineligible for listing on the NRHP and 51 (86%) were left unevaluated pending further research.

Table 29 – Number of NRHP listed, eligible, not eligible, and unevaluated archaeological sites in the 1.67 acre proposed project area boundary.

Site Type	# NRHP Listed Sites	# NRHP Eligible Sites	# NRHP Not Eligible Sites	# Unevaluated Sites	Total Sites
Prehistoric	23	256	265	1,354	1,898
Historic	7	50	165	120	342
Multicomponent	0	34	33	83	150
Undetermined	0	0	8	51	59

Paleontological Resources

Paleontological sites (fossils) are also within the project area. A total of 171 fossil bearing locations (totaling approximately 501 acres) have been identified within the project boundary, though more are likely. These fossils range in age with the earliest dating as far back as 16.3 million years. The paleontological sites contain a variety of fish and other vertebrate fossils that include numerous large and small mammals. Paleontological sites are typically in bare areas or in areas with little vegetation. Not all fossil locations warrant protection.

3.11.2 Environmental Consequences – Cultural Resources

Cultural Resource Inventories

Treatment areas would be delineated two years prior to treatment in order for cultural resource inventories to be completed. Because treatment areas may cover roughly 40,000 acres each year, and will encompass various levels of juniper density, cultural resource surveys would focus on areas that would pose the greatest risk to archaeological sites based on a predictability model and previous research in the area. These survey locations would include areas where heavy equipment will be utilized along roads, where pile or jackpot burning is expected, cutting crew camp areas, and in areas where archaeological sites would be expected due to environmental conditions.

Exemptions and Cultural Site Predictability Model

Because of the extensive project area, diverse nature of the treatment areas, and the expected lack of potential adverse impacts in many treatment locations, not all treatment areas would require cultural resource inventories. In the Idaho BLM's State Protocol Agreement with the Idaho State Historic Preservation Office, hand cutting of young juniper (less than 100 years old) where access is by foot is considered an exempt undertaking and may be excluded from cultural resource inventories. Additionally, timber management activities on slopes exceeding 30% may also be exempt from cultural resource inventories. These two exemptions would be applied if appropriate when specific treatment areas are identified.

Many areas may not meet the exemptions listed above and there is a possibility of significant archaeological sites being on slopes greater than 30%; therefore, a cultural resource predictive model, developed and field tested for Owyhee County (Hall et al. 2015, 2015; Ingbar and Wriston 2017) for prehistoric sites, may be used to better define sensitivity areas. The model

would help identify areas where cultural site probability is low, moderate, or high and, therefore, where treatments may impact historic properties (sites listed or eligible for the NRHP). The model would take into account slope, access to water, and other variables that attracted use of particular areas by Native Americans. The model would be further tested for its accuracy by conducting cultural resource inventories strategically across all probability levels. It would be used to guide cultural resource inventories within the proposed treatment areas. The model would be used in consultation with the Idaho State Historic Preservation Office and the local Native American Tribes as directed in the State Protocol Agreement between the Idaho State Director of the BLM and the Idaho State Historic Preservation Officer (2014). The model will not predict the presence or absence of historic archaeological sites; therefore, other methods of determining the location of historic sites may be used, such as historic General Land Office Maps and previous research in the area.

Impacts Common to Action Alternatives

Effects from the proposed juniper treatments would depend upon the treatment type, the location of the treatment, and the density of juniper trees. Pre-treatment inventories, design features (section 2.2.5), and mitigation measures specific to cultural resources would limit or eliminate the potential for adverse impacts to occur. The impacts identified below would largely be confined to potential sites that may go undetected by the predictive model and historic research; however, the likelihood of this occurring should be low. If a previously undetected site is discovered during treatment implementation, adjustments would immediately be made to minimize impacts (e.g., by applying appropriate design features and/or mitigation measures).

Cut and Leave

In treatment areas where juniper trees are small and widely scattered, juniper would be accessed by foot and executed using hand tools. If necessary, limbs would be scattered. This treatment type in an archeological site would pose a negligible or no direct impact to a cultural resource site.

In wilderness areas (Alternative B), only trees less than 8 inches in diameter would be cut and only using handsaws. This method of treatment may be used within sites since it would cause a negligent disturbance, but this treatment would be determined on a site by site basis. In areas with thickets of small diameter juniper, the biomass left on top of a site may result in indirect impacts to a site if a wildfire passes through the area burning the dried biomass. The extent of impacts from wildfire would depend on the amount of biomass and the intensity of the fire.

Mastication

Where juniper trees are dense along roads, juniper will be masticated using heavy machinery in the 200-foot treatment buffer to reduce fuel buildup. Direct impacts from heavy machinery could disturb or damage features such as hearths or rock features, break artifacts, and displace artifacts from distinct tool manufacture or activity areas. However, this would be negligible because surveys would be completed prior to treatment and design features would be applied to protect cultural sites (Section 2.2.5). A thick layer of wood chips on a site could cover artifacts and features. An indirect impact to a site could damage surface artifacts and features if the wood chips burn. Wood chips could create an environment where fire burns hot for a prolonged period

of time thus burning combustible materials, melting glass, cracking ceramics and adversely affecting hydration bands[10] on obsidian artifacts.

Jackpot and Pile Burning
Direct adverse impacts from jackpot burning could include destruction of combustible materials, melting of glass, changes in obsidian hydration rims when temperatures exceed 400°F (Schroder 2002), and spalling and cracking of stone artifacts and ceramics from heat exposure. Indirect impacts from pile or jackpot burning could include exposure of artifacts that were obscured by vegetation which could increase unauthorized collection and possibly some short-term increase in erosion until vegetation grows back.

OHV Use
The use of OHVs (i.e., ATVs or UTVs) to access juniper cutting areas would be limited across the project area. Although OHVs have the potential to create long-term major damage on sites if redundant, design features – single-pass cross-country travel only, rubber tired vehicles only, traveling only on firm soils, and not accessing cutting areas from main roads – would limit or eliminate the potential for adverse impacts.

Paleontological Resources
Treatments in paleontological sites would be addressed on an individual basis. If juniper treatments occur in or near a site, fossils could be damaged. Since paleontological sites are typically in bare areas or in areas with little vegetation, the risk of disturbance to paleontological sites would be minor as treatments in these areas would be improbable. There is little data concerning fire’s impact on paleontological resources. Research conducted in the Badlands National Park confirmed that fossil specimens that come in contact with burning fuel will discolor and fracture depending on the intensity of the fire (Benton and Reardon 2006). They also found that under high intensity burns fossils exhibit discoloration even when not in contact with fuels. Therefore, jackpot burning would not be allowed in areas of paleontological resources and juniper materials piled for burning must be at least 10 meters from paleontological sites (see section 2.2.5, Design Features).

3.11.2.1 Alternative A – No Action

There would be no new disturbance to cultural or paleontological resource sites in the project area. Sites in sagebrush habitat with encroaching juniper would continue to see encroachment and the potential for reduced shrub and herbaceous plant components that stabilize the soil. Increased erosion potential could, in turn, increase the potential for disturbance to or damage to cultural and paleontological sites.

3.11.2.2 Comparison of Action Alternatives

The following comparison of alternatives considers information in the identified focal treatment areas. In the Alternative B focal treatment area the number of acres previously surveyed for cultural resources is 75,099 acres or about 11% of the proposed treatment area. In the Alternative C focal treatment area there have been 74,071 acres surveyed or 11% of the

[10] Fractured obsidian absorbs water over time forming a band that can be measured to determine the age of the artifact.

treatment area. In the Alternative C1 focal treatment area there have been 83,855 acres surveyed or approximately 12% of the treatment area. Table 30 provides a comparison of the number of cultural and paleontological sites that are known to occur in the Alternative B, C and C1 treatment areas. Also, there are 24,810 NRHP archaeological district acres in the proposed project boundary for the Alternative B focal treatment area, and 17,853 acres for both the Alternative C and C1 focal treatment areas.

Table 30 – Comparison of Cultural and Paleontological Sites within Proposed Project Area

Cultural	**Alternative B**	**Alternative C – No Wilderness**	**Alternative C1 – No Wilderness**
Prehistoric Sites	1,281	1,159	1,213
Historic Sites	182	170	180
Multicomponent Sites	95	93	98
Undetermined Site Type	37	27	29
Total # of Sites	1,595	1,449	1,520
Linear Sites	98 miles	96 miles	98 miles
Isolated Finds	504	503	524
Paleontological	**Alternative B**	**Alternative C – No Wilderness**	**Alternative C1 – No Wilderness**
Fossil Locations	16	16	16

3.11.2.3 Alternative B – Treatment Including Wilderness

Impacts from implementation of this alternative could result in direct and indirect effects to cultural resource sites. Direct effects would depend on the type of treatment but could include artifact breakage, damage to features, annihilation of combustible materials, and adverse effects to obsidian hydration bands used for dating sites with obsidian. Indirect effects may include some of the same actions and could also include unauthorized collection in areas where jackpot or pile burning have exposed the soil's surface and artifacts. Effects to unknown sites that are not found through cultural resource surveys are expected to be minimal since selection of survey areas will be based upon the ground disturbing activities chosen in the treatment areas and the presence of archaeological sites. Bearing trees and other historical markers would not be impacted (Section 2.2.5).

In order to eliminate adverse effects to known cultural resources, the project design features (section 2.2.5) will be implemented in treatment areas when listed, eligible or unevaluated sites are present. These sites may be avoided during treatments or the potential for adverse effects would be mitigated through the design features. Mitigation may include site avoidance or some other action that would produce negligible to no effect on the properties that make a site eligible for listing on the NRHP. For example, one mitigation treatment within a site may include felling juniper by chainsaw then piling branches off site to burn. The type of mitigation measure(s) to use would be evaluated on a site by site basis dependent upon the treatment proposed and the density of juniper.

The Wilderness Minimum Requirements Decision Guide for Alternative B would ensure that juniper treatment methods in the wilderness would cause the least possible disturbance; therefore, there would be negligible impacts to cultural resources, as well. The need for cultural resource surveys and site identification prior to project implementation would be assessed just as

it would for areas outside wilderness. In addition, project design features would also apply to sites within wilderness.

3.11.2.4 Alternative C – No Treatment in Wilderness

All of the design criteria specific to cultural and paleontological resources described in section 2.2.5 and mitigation measures mentioned in Alternative B would apply here (except for wilderness specific actions). Of the 653,000 acres proposed for treatment, 74,071 acres (11%) have been surveyed for cultural resources. Approximately 31,000 fewer acres than Alternative B would be treated, so 146 fewer known cultural sites, 2 fewer linear miles, 6,957 archaeological district acres, and the same number of paleontological sites would require application of design features or mitigation. Impacts to unknown cultural and paleontological resources would be similar to those described for Alternative B.

3.11.2.5 Alternative C1 – Preferred Alternative

All of the design criteria specific to cultural and paleontological resources described in section 2.2.5 and mitigation measures mentioned in Alternative B would apply here (except for wilderness specific actions). Of the approximately 726,000 acres proposed for treatment, 83,855 acres (approximately 12 %) have been surveyed for cultural resources. Roughly 73,000 more acres than Alternative C would be treated, so 71 more known cultural sites, 2 more linear miles, the same number of archaeological district acres, and the same number of paleontological sites would require application of design features or mitigation. Impacts to unknown cultural and paleontological resources would be similar to those described for Alternative B.

3.11.3 Cumulative Impacts – Cultural and Paleontological Resources

3.11.3.1 Scope of Analysis

The spatial boundary for cumulative effects is the larger proposed project area of 1.67 million acres which includes Idaho State administered lands. The temporal scope will be for the duration of the project. The following cumulative impacts analysis would apply to all alternatives.

3.11.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Wildfires

Past large fires in the larger project area have had adverse impacts on sites that contain combustible materials. Additionally, fires that burn across any type of archeological site may leave them vulnerable to erosion and unauthorized collection from exposing artifacts. Future wildfires in areas that have not previously burned may also burn combustible materials and expose artifacts for collection. In areas where heavy concentrations of juniper trees would be dropped during implementation of the BOSH Project, but not jackpot or pile burned, there may be cumulative impacts to sites if a wildfire burns through the area and the fuels burn for a long duration. These impacts could range from short-term to long-term and could range from no effect to major effects dependent upon the intensity of the wildfire, the vegetation component, and the artifacts or features present in the cultural/paleontological site.

Livestock Grazing

Several studies indicate that livestock grazing can have adverse direct and indirect impacts on archeological sites. "Direct impacts include trampling, chiseling, and churning of site soils, cultural features, and cultural artifacts including artifact breakage. Impacts occurred from standing, leaning, and rubbing against historic and prehistoric structures and features including rock art panels. Indirect impacts included soil erosion and gully formation and increased access from roads and trails that attract higher recreational use and vandalism. The studies concluded that areas of livestock concentration could cause substantial ground disturbance and cumulative, long-term, irreversible adverse effects to historic properties" (USDI BLM 2006).

Livestock grazing will continue to impact sites when livestock congregate around gates, corrals, salt licks, troughs, water gaps and wet areas. Livestock congregation areas typically result in trampling of sites and churning soils to a depth greater than 3 inches. If cutting juniper along streams and springs results in more water in streams and springs that will attract livestock, then there may be additional adverse effects to sites. There will be cumulative adverse effects to sites if this occurs. These impacts could range from short-term to long-term and could range from no effect to major effects dependent upon the intensity of livestock grazing in the area and the artifacts or features present on the historic property.

Recreation

It is inherently difficult to determine where recreation (particularly dispersed recreation) will occur on the landscape; however, most people gravitate to areas with water. Water was more prevalent across the landscape in the past and that is where humans camped, along streams, near springs and along lake edges. Humans have always camped in similar areas because those areas provide certain characteristics that make them attractive camp site locations. Many archeological sites have been impacted in the past by dispersed camping and OHV use and will continue to be impacted. An increase in water near springs and meadows may attract people to those areas where they have not camped previously but were used in prehistoric or historic times. There may be cumulative impacts from dispersed recreation.

These impacts could range from short-term to long-term and could range from no effect to major effects dependent upon the artifacts or features present on the historic property. It is not uncommon for people to collect historic or prehistoric artifacts, use grinding stones in campfire rings, use wood from historic structures or features as firewood, or dig pits and trenches in recreation sites. These actions could destroy the integrity of a site by moving artifacts from their original location or off site, destruction of features, and ground disturbing activities that adversely affect the integrity of subsurface resources. OHV use on an archeological site could damage the site through loss of soil and vegetation, gullying, deflation of cultural deposits, and displacement and damage to artifacts and features (Sampson 2007). These impacts are typically done through repeatedly driving through a site and the magnitude of the impacts would be dependent upon soil types and the type of historic resource being impacted.

Exurban Development

Development for energy, agriculture, housing etc. on lands adjacent to public lands can impact sites by fragmenting them or destroying portions of larger sites that cross land boundaries. These impacts are typically long-term, major and finite. Section 106 of the National Historic Preservation Act would be applied to developments on public lands; therefore impacts to sites

would be avoided or mitigated. There could be cumulative effects to sites that cross property boundaries from exurban development.

Tri-state & Bruneau Fuel Breaks
Development of fuel breaks within southwest Idaho may reduce large scale fires thus potentially reducing adverse effects to archeological sites with combustible material. Reducing vegetation in fuel breaks may make sites more visible to the public which in turn may cause indirect adverse effects from unauthorized collection or excavation. Conversely if a site is avoided by project activities it may signal that there is potentially an archeological site there. All unevaluated or eligible archeological sites will be avoided or adverse impacts mitigated in those projects, therefore there will be no cumulative impacts from these projects.

Juniper Treatments
Pole Creek, Trout Springs, South Mountain, Johnston Draw projects have design features in place, so cultural sites will be avoided or burned over but no adverse effects are anticipated. Eligible and unevaluated archeological sites with combustible material will be avoided in these projects. No adverse effects to any sites within these projects have occurred or will occur due to site mitigation or design features built into the projects. Therefore, these projects would not add to the impacts of other actions occurring in the project analysis area.

3.11.3.3 Alternative A – Cumulative Impacts

In the absence of juniper treatments cumulative impacts to sites would continue from wildfire, livestock grazing and dispersed recreation. The increase in juniper across the landscape may increase the risk of erosion from a decrease in the soil stabilizing brush and grass component. These impacts could range from minor to major and for a short to long term dependent upon the affected resource.

3.11.3.4 Alternative B – Cumulative Impacts

Cumulative impacts to cultural resource sites may occur near springs or streams if juniper reduction results in an increase in water that attracts more dispersed recreation or livestock use. Cumulative impacts may also occur in areas where juniper have been cut creating biomass that ultimately burns in a wildfire or by increasing the shrub and grass component which also readily burns. These impacts would be minor since mitigation measures and design criteria would be implemented to protect unevaluated, eligible, and listed cultural resource sites in the proposed BOSH Project. Past, present and foreseeable future actions would have no measureable cumulative impacts to cultural resource sites since design features or mitigation measures have been and would be implemented for site protection.

Cumulative impacts in wilderness (37,000 acres) would be the same as described for Alternative A. Since the treatments in wilderness areas are so light on the land, there would be little difference between cumulative effects for Alternative A and B in the wilderness area.

3.11.3.5 Alternative C – Cumulative Impacts

Cumulative impacts under this alternative would be similar to those discussed in Alternative B in non-wilderness areas. However, under Alternative C there would be fewer known cultural

resource sites to apply design criteria to since there are approximately 37,000 fewer treatment acres proposed with the potential for cultural resources.

3.11.3.6 Alternative C1 – Preferred Alternative

Cumulative impacts under this alternative would be similar to those discussed in Alternative B in non-wilderness areas. However, under Alternative C1 there would be more known cultural resource sites to apply design criteria to since there are approximately 73,000 more treatment acres proposed with the potential for cultural resources.

3.12 Fire Behavior

3.12.1 Affected Environment – Fire Behavior

The vast majority of the of the focal treatment area consists of juniper with a canopy cover from 1-10% and fits the GS2 fire behavior fuel model: dry climate, mixture of grasses and shrubs where shrubs are 1 to 3 feet high with a moderate grass load, and fire spread rate and flame length are moderate (Scott and Burgan 2005). Areas where juniper has encroached to 11% and greater canopy cover fit the TU1 fuel model: dry climate, timber understory where the fuel bed is a low load of grasses and/or shrubs with litter, and fire spread rate and flame length are low (Scott and Burgan 2005).

3.12.2 Environmental Consequences – Fire Behavior

3.12.2.1 Alternative A – No Action

Fire behavior in the project area would remain characteristic of the GS2 fuel model with pockets of woodlands characteristic of the TU1 fuel model. However, over the long term (10+ years), as juniper increase in density, areas characteristic of the GS2 fuel model would gradually transition to the TU1 fuel model. Understory perennial grasses, forbs, and brush species would continue to decline as litter layers deepen and conifers continue to utilize the limited site resources. With the die off of ladder fuels (grasses and shrubs) due to juniper encroachment, fire behavior would moderate with lower flame lengths and rates of spread. As the fine fuels decline and become disconnected from the tree canopies, more extreme weather conditions are required to spread a fire through the tree canopy. This shift in fuel abundance and structure would change the fire regime on an ecological site to less frequent but more severe fires. Wildfires would burn with higher intensity and severity, leading to catastrophic effects to soils, vegetation, and wildlife habitat (Miller and Tausch 2001; Miller et al. 2005; Miller et al. 2008; Miller et al. 2013).

3.12.2.2 Alternative B – Treatment Including Wilderness

Residual biomass from treatment of juniper (e.g., cutting, limbing, and mastication) would not inherently increase the likelihood of natural fire ignition, but fire behavior may be influenced by the proposed juniper treatments. There would be a short-term (1 to 2 year) risk of higher intensity and higher severity fire. Juniper treatments proposed in the vast majority of the 684,000-acre focal treatment area (and greater project area) include cutting, lopping, and scattering low densities of juniper within the GS2 fuel model. Treating areas where juniper are sparsely distributed would have negligible or no effect on fire behavior where the primary carriers of fire are grasses and shrubs, and spread rates are generally high and flame lengths are moderate.

In areas with juniper cover from 10-20%, the TU1 fuel model represents potential fire behavior where the spread rate is low, flame length is low, and the primary carrier of fire is a low load of grass and/or shrub with litter. If a cut and leave treatment is used, these areas would likely transition into an SB3 fuel model: slash-blowdown where spread rates are high, flame lengths are high, and the primary carrier of fire is a heavy dead and down activity fuel (**Error! Reference source not found.**); Scott and Burgan 2005). This would pose a short-term (1 to 2 year) risk of higher intensity and higher severity fire. The risk of intensified fire behavior is of particular concern along transportation corridors.

To mitigate fire risk, mastication, piling and burning, or jackpot burning would be utilized to minimize or remove fuels (refer to section 2.2.4 for treatment methods). Mastication and machine piling would be accomplished with heavy equipment up to 200 feet on each side of the road corridor, and jackpot burning would be used as necessary across the project areas with juniper cover from 10-20%. Pile burning and jackpot burning wouldn't occur until approximately 1-2 years post-treatment to allow juniper material (fuels) to cure, posing a short-term risk of increased fire behavior until the fuels are expended.

Currently no fuel models exist for predicting fire behavior in areas where mastication has been utilized as a fuels treatment. If a mastication treatment is utilized, there could be a significant increase in fuel loading of 1-hour and 10-hour fuels; however, masticated fuels are generally expected to reduce the intensity and rate of spread of fire over the short and long term (Kreye et al. 2014).

Juniper treatments would occur primarily in areas with 1-10% juniper canopy cover and would have little to no effect on fire behavior. When areas of 10-20% juniper canopy cover are treated, there is a short period of time (1-2 years) when fire risk would be elevated to allow fuels to cure so they me be expended through pile and jackpot burning.

3.12.2.3 Alternative C – No Treatment in Wilderness

Fire behavior in the 653,000-acre focal treatment area (non-wilderness) would be identical to what was described in Alternative B. Fire behavior in wilderness would be identical (31,000 acres) to what was described for Alternative A.

3.12.2.4 Alternative C1 – Preferred Alternative

Fire behavior under this alternative (on 726,000 acres) would be identical to what was described for Alternative B in non-wilderness, and identical to Alternative A in wilderness. Although there is an increase in focal treatment acres, the methods of treating juniper and mitigating fire risk through pile and jackpot burning would have the same effect on fire behavior.

3.12.3 Cumulative Impacts – Fire Behavior

There would be no additive impacts to fire behavior because overall effects from the proposed project would be negligible when considered with other past, present, and future actions.

3.13 Air Quality

3.13.1 Affected Environment – Air Quality

The project area falls within the Owyhee and Bruneau Field Office boundaries. Both land management areas are designated as Class II airsheds, which allows moderate deterioration of air quality associated with moderate, well controlled industrial and population growth. The project lies within or adjacent to five designated wilderness areas: North Fork Owyhee, Pole Creek, Little Jacks Creek, Big Jacks Creek and Owyhee River. These wilderness areas are also classified as Class II airsheds, unless reclassified by the state as a result of procedures prescribed in the Clean Air Act (USDI BLM 2012). The Jarbidge Wilderness (approximately 90 miles to the southeast) and Sawtooth Wilderness (approximately 85 miles northeast) are the closest designated Class I airsheds.

Air quality which can affect human health and welfare or the environment is monitored by the Idaho Department of Environmental Quality (IDEQ). The IDEQ monitors six pollutants: carbon monoxide, ozone, nitrogen dioxide, lead, sulfur dioxide, and particulate matter. Dust, smoke, and chemicals can result in small particles suspended in the air (i.e., particulate matter). When small enough, particulate matter can penetrate the lung and cause various health concerns. Agricultural activities, smoke from fires or wood burning, and dust contribute to particulate matter.

Currently air quality complies with federal and state standards due to a lack of emission sources throughout much of the project area and its rural setting. The major emission sources in the area result from seasonal burning of farm fields. Most livestock operations in the area contribute only small amounts of particulate matter into the atmosphere. Large feedlot operations can be a major source of ammonia, hydrogen sulfide, and dust. There are no large feedlot operations in the project area. Four of these operations occur north of the project area: a dairy farm near the Hemingway Butte Recreation Area and one in Kuna, as well as two feedlots in the town of Melba.

The Airshed group is comprised of federal, state and local agencies, and the forest products industry to monitor and coordinate smoke emissions for wildfires and prescribed burning. All requests for approval are sent to the Idaho–Montana Airshed group each day prior to burning. In the event the Airshed group determines that air quality is not acceptable because the planned prescribed fire would have a negative impact, approval is denied and burning is not allowed.

3.13.2 Environmental Consequences – Air Quality

Impacts Common to Action Alternatives

Potential pollutants from jackpot or pile burning include particulate matter (PM, PM10, and PM2.5), carbon monoxide (CO), volatile organics including methane (CH4) and nitrogen oxides (NOx) (Environmental Protection Agency [EPA] 1996). Emissions from sulfur oxides (SOx) and lead (Pb) would be none or negligible. Other potential greenhouse gas emissions include non-methane hydrocarbons (NMHC) which are precursors to ozone formation and carbon dioxide (CO_2).

Maximum potential emissions for each pollutant were calculated using the Consume model (version 4.2; USDA FS 2017) for all action alternatives. Consume is a physics-based model that

uses a set of empirically derived equations developed from field data and a rule-based system developed from anecdotal evidence to help predict pollutant emissions (Ottmar 2014). Emissions of NOx are not calculated and is a limitation of the Consume model; therefore, are not carried forward in the analysis.

All emissions were calculated utilizing the Piled Fuels Biomass and Emission Calculator within the Consume model. The following assumptions were used to help derive the inputs necessary to run the model and predict the maximum potential emissions from pile and jackpot burning for each action alternative:

- Acres used to calculate emissions for each action alternative were spilt into two categories: pile burning and jackpot burning. Pile burning would occur primarily within 200 feet of roadways, whereas jackpot burning would occur primarily in the treatment area interior (i.e., >200 feet from roadways). Acres of treatment types presented in Table 3 (section 2.3, Comparison of Action Alternatives) were used as inputs for the Consume model.
- Pile burning consumes a larger percent of biomass than jackpot burning primarily because concentrated fuels in piles burn more efficiently than jackpot fuels that are burned where they are felled and not further concentrated. To capture this variability, the Consume model was calibrated to assume 90% consumption of piled biomass concentrations and 75% consumption of jackpot biomass concentrations. This is consistent with studies that show 90% consumption is reasonable for piled biomass and 75% consumption is reasonable for jackpot biomass concentrations (Brown et al. 1991, Hardy 1996, Ottmar 2014, Wright et al. 2015). Table 31 represents the total maximum potential emissions over the life of the project (i.e., 10-15 years) from pile and jackpot burning combined for each action alternative.
- Fuelbed inputs required for Consume were derived from two Natural Fuels Photo series for western juniper (Ottmar et al. 1998, Ottmar et al. 2009) which provide the most accurate range of fuelbed characteristics within areas targeted for pile and jackpot burning. These photo series, Western Juniper 04 (WJ04) and Eastern Oregon Sagebrush with Juniper 02 (EOSJ02), represent 8.6% to 15% canopy cover, respectively. The live crown mass, i.e. mostly branches and needles and excluding thickest part of stem or bole, for these two canopy cover classes was 0.70 and 2.63 US tons/acre, respectively. Since these estimates were the closest available for juniper canopy cover classes proposed for treatment and potential pile or jackpot burning (i.e., 10-20%), live crown mass estimates were averaged across the two classes. The average live crown biomass of 1.66 US tons per acre was used in the Consume model as the amount of available biomass that may be consumed from pile or jackpot burning. Live crown biomass estimates were used for estimating consumption from pile or jackpot burning, because the majority of pile burning would take place in heavy pockets of juniper where only limbs and foliage would be piled and burned and boles left behind.
- To provide estimates of the potential maximum level of emissions in any given year (Table 32), the Consume model was calibrated to assume 90% consumption of biomass from prescribed burning 15,000 and 7,500 acres at 1.66 US tons per acre. This is

consistent with management actions and allocations provided in Objective FIRE 3 of the Owyhee RMP (USDI BLM 1999) which allows no more than 15,000 acres to be prescribe burned in any given year with a goal of up to 7,500 acres per year.

Table 31 – Comparison of potential maximum emissions by pollutant for estimated acres of pile and jackpot burning combined in focal treatment area over the life of the project (15 years).

Alternative	Estimated Pile Burning Acres	Estimated Jackpot Burning Acres	Biomass Consumption[1] (US tons/acre)	Emissions by Pollutant (tons)						
				PM	PM_{10}	$PM_{2.5}$	CO	CO_2	CH_4	NMHC[2]
B	7,000	79,000	1.66	1,194	845	737	4,144	181,492	351	247
C	7,000	79,000	1.66	1,194	845	737	4,144	181,492	351	247
C1	8,000	96,000	1.66	1,443	1,021	890	5,007	219,285	370	298

[1] Piled Fuels Biomass and Emission Calculator was used with a biomass of 1.66 US tons/acre within the Consume (version 4.2) model. The model was set to assume 90% consumption of the piled biomass concentrations and 75% consumption of the jackpot biomass concentrations.
[2]Non-Methane Hydrocarbon is the sum of all hydrocarbon air pollutants except methane; precursors to ozone formation.

Table 32 – Maximum emissions potential by pollutant for estimated annual acres of prescribed burning

Estimated Annual Treatment	Estimated Prescribed Burning Acres	Biomass Consumption[1] (US tons/acre)	Emissions by Pollutant (US tons)						
			PM	PM_{10}	$PM_{2.5}$	CO	CO_2	CH_4	NMHC[2]
Owyhee RMP Maximum Allowable	15,000	1.66	246	174	152	853	37,378	63	51
Owyhee RMP Goal	7,500	1.66	123	87	76	427	18,689	31	25

[1] Piled Fuels Biomass and Emission Calculator was used with a biomass of 1.66 US tons/acre within the Consume (version 4.2) model. The model was set to assume 90% consumption of jackpot biomass concentrations.
[2]Non-Methane Hydrocarbon is the sum of all hydrocarbon air pollutants except methane; precursors to ozone formation.

3.13.2.1 Alternative A – No Action

Over the short term, there would be little to no impacts to air quality from this alternative. Over the long term (30+ years), as juniper density increases, understory perennial grasses, forbs, and native brush species would decline. As fuels are reduced in the understory and become disconnected from the tree canopies, more extreme weather conditions are required to spread a fire through the tree canopy. This shift in fuel abundance and structure would change the fire regime on an ecological site to less frequent but more severe fires. Wildfires would burn with higher intensity and severity. After a wildfire sweeps through dense juniper woodland, the area is likely converted to invasive annual grassland, e.g. cheatgrass (Taylor et al. 2013); thus altering fire behavior and making these and adjacent areas more prone to fire. Under Alternative A, wildfires would burn with higher intensity and severity in dense juniper woodlands, and fire

frequency would increase in converted annual grasslands. This increase in wildfire frequency, intensity, and severity would lead to increased emissions affecting air quality.

3.13.2.2 Alternative B – Treatment including Wilderness

All burning activities would comply with the smoke management program for the State of Idaho which is regulated by Idaho-Montana Airshed group and the Clean Air Act, and air quality effects would not exceed the National Ambient Air Quality Standards (NAAQS) (section 2.2.4 Methods). Jackpot and pile burning would have a moderate, short-term negative effect on air quality and visibility in the immediate area during and directly following the actual activity. Impacts to air quality from prescribed burning could range from reduced visibility to pneumonic irritation and smoke odor affecting people in proximity to the Project Area. These impacts would mainly occur during the ignition/burning phase and subside within one to three days.

Up to 7,000 acres of pile burning and 79,000 acres of jackpot burning would be implemented over the life of the project. Potential maximum emissions from these activities are provided in Table 31 above. Burning would not exceed 15,000 acres in any given year per the Owyhee RMP; BLM anticipates burning between 5,000 and 7,000 acres annually, so emissions would be similar to the annual Owyhee RMP Goal (Table 32). Impacts to air quality from mechanical treatments (cutting, mastication) would be airborne dust (particulates) generated while operating heavy equipment and road use for implementation of projects. These impacts would be limited to the immediate area around the equipment and would end when operations cease.

Burning would be implemented under conditions that would allow only the targeted concentration of treated fuels to be burned, and not the surrounding live vegetation. Environmental conditions that prevent the spread of fire outside of the pile or jackpot fuels include snow covered or frozen ground, recent measureable rainfall, or substantial green-up of grasses with minimal fine dead fuels (grasses) present (i.e., late fall through early spring) (section 2.2.4 Methods). Prescribed fire operations would be completed on acceptable moderate to high air quality days with appropriate winds to reduce the impact zones of Boise and the greater Treasure Valley population. Smoke impact within the project area would be negligible in Boise and the Treasure Valley. No Class 1 airsheds would be affected. No prescribed burning is proposed in Wilderness areas, however short-term localized drift smoke may exist one to two days following ignition within these areas.

Burning above ground biomass (cut juniper) would release carbon into the atmosphere. The majority of felled juniper stems/boles would not be burned and ultimately decompose over the next 20-50 years. Any decomposition would likely result in a slow release of carbon, with some returning to the soil and being converted to soil organic carbon over time (Rau et al. 2011). Juniper root biomass may also return organic carbon to soils. Over the long term, proposed treatment under Alternative B may reduce future emissions from wildfire by improving the resilience and resistance of sagebrush-steppe habitats to wildfire and invasion of cheatgrass (Taylor et al. 2013, Chambers et al. 2016). See Carbon Sequestration (section 3.14) for more detail regarding carbon release and storage/sequestration.

3.13.2.3 Alternative C – No Treatment in Wilderness

Effects to air quality from pile and jackpot burning would be the same as Alternative B as no prescribed fire is being proposed in wilderness areas under either alternative. Impacts in the form of airborne dust (particulates) would be less than Alternative B as 31,000 fewer acres would be treated in this scenario.

Identical to Alternative B, up to 7,000 acres of pile burning and 79,000 acres of jackpot burning would be accomplished under Alternative C over the life of the project, but would not exceed 15,000 acres in any given year. Potential maximum emissions from these activities are provided in Table 31 and Table 32.

3.13.2.4 Alternative C1 – Preferred Alternative

Effects to air quality from pile and jackpot burning would be the same as Alternative B because both alternatives are limited to the number of acres that could be burned in any given year. The duration of impacts (life of the project) however maybe prolonged as there is an increase of 17,000 acres that may be jackpot burned under Alternative C1. Effects from juniper cutting (cut and leave) in the form of airborne dust (particulates) may also increase as approximately 24,000 more acres would be treated in this manner compared to Alternative B.

Up to 8,000 acres of pile burning and 96,000 acres of jackpot burning would be accomplished under Alternative C1 over the life of the project but would not exceed 15,000 acres in any given year. Potential maximum emissions from these activities are provided in Table 31 and Table 32.

3.13.3 Cumulative Impacts – Air Quality

3.13.3.1 Scope of Analysis

The scope of analysis covers Owyhee County in southwest Idaho. This scope of analysis was selected based on the extent of project actions impacting areas outside of Owyhee County, which is unlikely to occur. This is due to the small scale and limited amount of prescribed burning that would occur on an annual basis as part of the BOSH Project and based on the conditions of when burning would be allowed to occur. All prescribed fire would only be initiated when conditions would be conducive to rapid smoke dispersal based on compliance with the Idaho-Montana Airshed Group and Clean Air Act.

3.13.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions

Air Quality in the project area and surrounding landscape is generally good except for the short-term effects from large prescribed fire and wildfire events. Dairy, feedlot, farm field burning and industrialized pollution from neighboring towns and cities contribute to localized air quality effects. These effects are mitigated by the rural nature of the analysis area.

3.13.3.3 Alternative A – Cumulative Impacts

Future large prescribed fire projects in Owyhee County could reduce air quality from particulate matter and gas emissions in the short term. Dairy farms, feedlots and industrialized pollution could impact air quality on a small scale. Grazing, recreation, wood cutting would be negligible

over the long term. Because wildfire is unpredictable, impacts would vary depending on fire size and intensity/severity.

3.13.3.4 Alternatives B, C, and C1– Cumulative Impacts

The limited amount of proposed pile and jackpot burning, and the mastication, and chainsaw use would cause a slight increase of particulate matter and gas emissions near the project area but these impacts would not be cumulative with other impacts within and outside of Owyhee County. This increase would have negligible short- and long-term impacts to air quality in association with other actions.

3.14 Carbon Sequestration

Carbon sequestration is the process of carbon capture and long-term storage of atmospheric carbon dioxide (CO_2) and other forms of carbon. CO_2 is the main greenhouse gas (GHG) emitted in the U.S. from burning of fossil fuels, trees and wood products, etc. (EPA 2017). Forests, including juniper woodlands like those in the project area, are terrestrial carbon sinks. These plant communities absorb (or sequester) carbon from atmospheric CO_2 via photosynthesis, which can offset GHG emissions.

3.14.1 Affected Environment – Carbon Sequestration

The BLM estimated carbon stored (i.e., carbon stock) in trees only, above-ground biomass, and the total ecosystem at several spatial scales. Tree only carbon stock is carbon contained in juniper trees alone. Above-ground biomass refers to carbon contained in live and dead trees, shrubs, herbaceous vegetation and litter. Total ecosystem refers to carbon contained in above-ground biomass plus roots and soil organic carbon.

Carbon Stock

Carbon stock for individual juniper trees, above-ground biomass, and total ecosystem were based on midpoints for each juniper cover class[11] (Table 33) and derived from Rau et al. (2012).

[11] Canopy cover greater than 20% is biased low due to difficulties with image classification in these areas (Poznanovic et al. 2014; Falkowski et al. 2017); therefore, carbon stock estimates in areas with >20% canopy cover are low. Additionally, there are likely a high number of acres in the 0-10% cover class that fall in 0-1% canopy cover. As a result, carbon stock assessment for trees in the 0-10% cover class is high. Thus, the proportion of carbon stock potentially removed under action alternatives from above-ground biomass (i.e., tree, shrub, herbaceous, and litter) would be a maximum estimate. The calculation for carbon stock includes numerous assumptions; therefore, while being a reasonable approximation, the numbers are an estimate and not a forecast.

Table 33 – Estimates for tree only, above-ground biomass, and total ecosystem carbon stock in juniper woodland and sagebrush steppe (Rau et al. 2012) vs. annual grassland (Bradley et al. 2006).

Habitat	Tree only (kg C / m^2)	Above-ground biomass (kg C / m^2)	Total ecosystem (kg C / m^2)
Juniper, 80% canopy cover	4.96	5.64	10.91
Juniper, 50% canopy cover	2.88	3.40	8.51
Juniper, 30% canopy cover	1.64	2.11	7.21
Juniper, 15% canopy cover*	0.79	1.24	6.39
Juniper, 5% canopy cover*	0.26	0.71	5.93
Sagebrush steppe, treeless	---	0.45	5.71
Annual grassland	---	0.06	---

*Carbon estimates for 5% and 15% canopy cover of juniper represent midpoints for treatments in 1-10, and 10-20% cover, respectively.

For analysis purposes, carbon stock estimates were determined for the following spatial scales: focal treatment areas (Alternative B - 684,000 acres, Alternative C - 653,000 acres, and Alternative C1 - 726,000 acres), project area (1.67 million acres), Bruneau and Owyhee Field Offices (3.41 million acres), southern Idaho (17.8 million acres), and juniper woodlands across the Intermountain West (42 million acres). Carbon stock for each spatial scale was calculated by multiplying carbon stock estimates (Table 33) by the number of acres in the different canopy cover classes, converted to teragrams (Tg) of carbon and summed.

Currently, there is an estimated 4.36 Tg C in above-ground biomass within the 1.67 million-acre project area. There is an estimated 8.37 Tg C in above-ground biomass in the 3.41 million acres in the BLM Bruneau and Owyhee Field Offices, and an estimated 39.81 Tg C in the 17.8 million acres across southern Idaho (Table 34). Carbon stock in the focal treatment areas for alternatives B, C, and C1 range from 0.48 to 0.56 Tg C for trees only, 1.87 to 2.14 Tg C for above-ground biomass, and 15.67 to 17.48 Tg C for total ecosystem (Table 34).

Table 34 – Estimates for tree only, above-ground biomass, and total ecosystem carbon stock in teragrams (Tg) in the project area and surrounding landscape and focal treatment areas.

Area/Spatial Scale	Tree only Tg C	Above-ground biomass Tg C	Total ecosystem Tg C
Southern Idaho – Tree Canopy Cover (17.8 mil acres)	5.73	39.81	417.57
BLM Bruneau and Owyhee Field Offices (3.41 mil acres)	1.53	8.37	80.71
Project Area C1 (1.67 mil acres)	0.95	4.36	39.57
Focal Treatment Area – Alternative B (0.68 mil acres)	0.49*	1.96	16.41
Focal Treatment Area – Alternative C (0.65 mil acres)	0.48*	1.87	15.67
Focal Treatment Area – Alternative C1 (0.73 mil acres)	0.56*	2.14	17.48

*Focal treatment area tree only carbon stock estimates the amount of carbon present in trees that would be removed for each alternative (e.g., by cutting and leaving, cutting and burning, or masticating junipers).

Table 35 illustrates the proportion of the project area's tree only carbon stock for above-ground biomass and total ecosystem carbon at three spatial scales. The carbon stored in juniper trees in the project area is 21.7% of project area above-ground biomass, 11.4% of Bruneau and Owyhee Field Offices above-ground biomass, and 2.4% of southern Idaho biomass carbon stock. For

total ecosystem carbon stock, the proportion of carbon stored in juniper trees is 2.4% of the total project area, 1.2% of Bruneau and Owyhee Field Offices, and 0.2% of Southern Idaho (Table 35).

Table 35 – Proportion of tree only carbon stock in above ground biomass[1] for the project area at three spatial scales.

Area/Spatial scale	Project area tree only C in above-ground biomass	Project area tree only C in total ecosystem
Project Area	21.7%	2.4%
Bruneau and Owyhee Field Offices	11.4%	1.2%
Southern Idaho	2.4%	0.2%

For further context, Table 36 presents the proportion of above-ground biomass carbon stock in the project area at larger regional and global scales. The 1.67 million-acre project area contains approximately 3.8% of the carbon stored in above-ground biomass across the western juniper woodlands in the Intermountain West (Tirmenstein 1999), 0.9% of all forest types in the Great Basin (Zhu et al. 2012), 0.0006% of forests in the western United States (Zhu et al. 2012), and 0.00001-0.00002% of the world's forests (Global Forest Resource Assessment 2010; Pan et al. 2011).

Table 36 - Proportion of carbon stock in above ground biomass[1] for the project area at four spatial scales.

Area/Spatial scale	Project area proportion of C in above ground biomass[1]
Intermountain West – juniper woodlands	3.8%
Great Basin – all forest types	0.9%
Western US forests	0.0006%
World's forests	<0.00002%

[1] Calculations are based on an average of 0.68 kg C / m^2 in above-ground biomass of juniper woodlands (Sankey et al. 2013).

GHG Emissions

Information on current GHG emissions in the project area is not available. There are, however, wildfires which typically occur annually within or adjacent to the project area. Wildfires release pollutants that contribute to GHG emissions and reduce future carbon stock due to loss of above-ground vegetation and changes to plant communities. Estimates in 2015 for GHG emissions in the U.S. due to wildfires ranged from 97.4 Tg Carbon dioxide equivalent (CO2e) (85.3 Tg CO_2 plus 12.1 CO2e for CH_4 and N_2O) (EPA 2017) to 159 Tg CO2e (143 Tg CO_2 plus 16 Tg CO2e for CH_4 and N_2O) in 2008 (Heath et al. 2011). GHG emissions from wildfires the western U.S. average 36.7 Tg CO2e per year (including CO_2, CH_4, and N_2O for 2001-2008) and 4.1 Tg CO2e per year for the Great Basin, but with substantial annual variation (Zhu et al. 2012).

Climate Change

Climate change is a far-reaching and long-term issue that could affect the project area, its resources, visitors, and management beyond the scope of this project in its 10-15 year timeframe. Although some effects of climate change are considered known or likely to occur, many potential impacts are unknown. Much depends on the rate at which temperatures continue

to rise and whether global emissions of greenhouse gases can be mitigated before ecological thresholds are reached.

Temperatures in the Great Basin have increased over the past 150 years (Kunkel et al. 2013). Under the two more common climate change scenarios, i.e., 1) start reducing GHG emissions in 2020 and 2) no changes to GHG emissions, temperatures are predicted to increase by 3.5-5.5 ˚F or 5.5-8.5 ˚F, respectively, by 2085. Changes in precipitation are less certain, but most models forecast less precipitation for southern Idaho with lower snow packs and less rain in the spring and particularly in the summer. With drier conditions and longer periods of time with temperatures over 90 ˚F, droughts would be more frequent and longer; conditions likely to result in more frequent and severe wildfires (Zhu et al. 2012).

The global carbon budget is not only affected by GHG emissions, but also the size of the ocean and terrestrial carbon sinks, such as forests, which absorb CO_2 from the atmosphere. In 2015, 12% of gross U.S. GHG emissions were assimilated by U.S. forests via photosynthesis and accumulation of soil organic carbon (EPA 2017). Across the globe, 17% and 27% of GHG emissions were absorbed by terrestrial and ocean sinks, respectively, while 56% of anthropogenic GHG emissions accumulated in the atmosphere (Global Carbon Budget 2016). There is uncertainty as to what extent carbon sinks can absorb atmospheric CO_2 and how much GHG emissions will continue to accumulate in the atmosphere and, thus, influence climate change.

3.14.2 Environmental Consequences – Carbon Sequestration

Assumptions for Analysis

Carbon Stock

Tree only carbon stock in the focal treatment areas (Table 34) was the metric used to estimate the amount of carbon that would be removed and or emitted under each action alternative (which includes only juniper canopy cover classes between 0 and 20%). Potential effects for each alternative were assessed by estimating net carbon sequestration in the project area and surrounding landscape. Net carbon sequestration was derived by:

> Current carbon stock in above-ground biomass – carbon stock removed from junipers = Net carbon sequestration

The estimated net carbon sequestration would be a maximum estimate since this would be over the life of the project (i.e., 10-15 years). During this time, additional carbon would be sequestered in juniper and other plants in and around the project area. Carbon from GHG emissions was not included in the calculation of net carbon sequestration, since carbon emitted during jackpot or pile burning was already accounted for in the carbon removed from cut trees. Estimates for GHG emissions were listed separately. The proportion of carbon stock removed from the total ecosystem carbon was also included in the analysis for context.

The analysis focuses on carbon storage in the project area potentially affected under each action alternative, emissions from jackpot or pile burning, as well as the qualification of changes to vegetation and projected wildfire associated with climate change. The analysis does not project future changes to carbon storage due to uncertainties associated with potential future wildfire,

conversion to annual grasslands, land use changes, shifts in plant communities, and climate change itself. Juniper growth and potential changes in carbon sequestration over the life of the project could not be determined for the following reasons: 1) forest growth models require information on stand age which is lacking for the area; 2) carbon accumulation rates vary by age (Miller et al. 2005) and soil, climate, and time (Strand et al. 2008); and 3) estimates for average annual sequestration rates in juniper range widely from 0.23 (Sankey et al. 2013) to 2.9 kg C / m^2 (Campbell et al. 2012).

GHG Emissions

Greenhouse gas emissions resulting from burning, i.e., CO_2 and methane (CH_4), were determined using the Consume model and were included by reference (section 3.13 Air Quality). Currently, the Consume model does not calculate nitrogen oxides (NOx); thus, NOx were omitted from analysis.

The analysis for GHG emissions focused on effects from jackpot or pile burning in focal treatment areas with 10-20% canopy cover under the various alternatives. Pollutants from burning include carbon dioxide (CO_2), methane (CH_4), and particulate matter (see section 3.13.2 Air Quality – Environmental Consequences; Table 31 and Table 32). GHG emissions under the various alternatives were based on the pollutants CO_2 and CH_4 and converted to CO_2 equivalents (CO2e). For context, emissions were compared to GHG emissions from wildfires in the Great Basin and the United States. GHG emissions were not compared to GHG emissions from prescribed burning since information is limited and typically data on prescribed fire are from different ecosystems than western juniper. GHG emissions from equipment use (e.g. chainsaws and mastication) were not included in the GHG emissions calculation because we anticipate the emissions being below or at a low level of detection, and only a minute amount of GHG released into the environment.

3.14.2.1 Alternative A – No Action

Under Alternative A, no junipers would be removed so carbon stock estimates would be as presented in Table 34, and there would be no GHG emissions from jackpot or pile burning. Over the long term (10+ years), carbon stock could increase[12] with continued growth and encroachment of junipers under this scenario. Once juniper canopy cover exceeds 30%, understory vegetation would be lost, including sagebrush, forbs, and perennial grasses. Therefore, vegetation communities sequestering carbon would change, but there would still be a net gain in carbon stock as juniper expands in the project area.

Where fire occurs in dense juniper woodlands, conversion to invasive annual grasslands would be more likely than in early encroachment or treated juniper woodlands (Taylor et al. 2013). Conversion of sagebrush steppe to cheatgrass and the subsequent loss of carbon could occur in the project area due to fire, particularly where plants are stressed and landscapes are less resistant and resilient. The decreased ability to absorb carbon, conversion to a system with less carbon stock, and wildfire would all act as carbon sources (i.e., release carbon into the

[12] The BLM could not quantify the amount carbon stock would increase due to future juniper growth/encroachment for the reasons listed under section 3.14.2, subsection Assumptions for Analysis.

atmosphere and contribute to GHG emissions) and thus potentially contribute to an increase in GHG emissions in the project area and possibly beyond.

As with other areas in the Great Basin, the risk and severity of wildfires would increase in the project area as a result of climate change. Predictions for the Great Basin are that 34-95% more area will burn by 2050 compared to 2006 and emissions from wildfires are predicted to increase 44-87% in typical years and 88-129% in extreme years (Zhu et al. 2012). Predicted climate change could also result in an increased likelihood of cheatgrass invasion into shrublands and burnt juniper woodlands in the project area. If juniper woodlands and shrublands are converted to cheatgrass, fire behavior would change, permanently making these and adjacent areas more prone to fire, and more difficult to restore.

3.14.2.2 Alternative B – Treatment Including Wilderness

Under Alternative B, 0.49 Tg of carbon stock in juniper trees may be removed from above-ground biomass (Table 34). Trees would be felled, cut into smaller pieces, and left on the ground. Some of this carbon would decompose and be returned to the ecosystem as soil organic matter or vegetation. For this reason as well as limitations with canopy cover classification, 0.49 Tg C would be a maximum of carbon stock removed through the life of the project under Alternative B. This represents roughly 11% of above-ground biomass carbon within the project area, 6% in the BLM Bruneau and Owyhee Field Offices, 1% in southern Idaho, and much smaller proportions of the total ecosystem carbon at these spatial scales (Table 37).

Table 37 – Proportion of carbon stock removed from above-ground biomass and total ecosystem carbon at three spatial scales (Alternative B).

Area/Spatial Scale	Above-ground biomass	Total ecosystem
Project Area	11.2%	1.2%
BLM Bruneau and Owyhee Field Offices	5.9%	0.6%
Southern Idaho – Tree Canopy Cover	1.2%	0.1%

Outside of focal treatment areas and within the project area or surrounding landscape, junipers would continue to grow in denser stands not targeted for treatment, individual old-growth trees, private property, etc. Changes in distribution of plant communities from climate change effects would be the same as under Alternative A. Therefore, effects to carbon stock would be negligible over the life of the project, particularly for each year of treatment.

Jackpot and pile burning would result in a short-term increase in CO_2 emissions and contribute to GHG emissions. Over the life of the project (i.e., 10-15 years), an estimated 0.17 Tg of CO2e (181,492 US tons CO_2 plus 351 US tons CH_4; Table 32) would be released into the atmosphere from burning under Alternative B, but no more than 0.035 Tg CO2e would be released per year (Table 32). The overall project emissions would be a small fraction compared to annual CO_2 releases from wildfires: 4% of GHG emissions from wildfire in the Great Basin (Zhu et al. 2012) and < 0.2% from the conterminous U.S. in 2015 (EPA 2017). Annual contribution to GHG emissions from Alternative B would be approximately 10% of the estimated 0.17 Tg of CO2e for the life of the project, or 0.4% of emissions from wildfires in the Great Basin. Effects of GHG emissions from potential wildfires would be the same as described for Alternative A.

Despite GHG emissions under Alternative B, the project area would be restored to what was historically a “large, contiguous area of sagebrush with occasional small interruptions of (juniper) woodlands” (Bukowski and Baker 2013). Alternative B treatments would result in a short-term carbon source to the atmosphere through the reduction of carbon stock in above-ground biomass and burning. In the long term, treatment would create a sagebrush-steppe more resilient to juniper encroachment and resistant to invasion of cheatgrass. This translates to an ecosystem more resilient to the effects of climate change. Potential effects on climate change would be negligible since carbon stock in above-ground biomass within the project area represents such a small percentage of carbon stock in the U.S. or the world (i.e., 0.02 and 0.002 %, respectively) and, therefore, would not contribute to any measurable changes in the global carbon budget or accumulation of GHG emissions.

3.14.2.3 Alternative C – No treatment in Wilderness

Potential effects to carbon stock, GHG emissions, and climate change under Alternative C would be very similar to Alternative B. Under this alternative, 31,000 fewer acres (wilderness) would be treated compared to Alternative B. Over the life of the project an estimated 0.48 Tg carbon stock in junipers may be removed from above-ground biomass (Table 34); 0.01 Tg C less than Alternative B. Identical to Alternative B, this would represent 11% of above-ground biomass carbon within the project area, 6% in the BLM Bruneau and Owyhee Field Offices, and 1% in southern Idaho (Table 37). GHG emissions and impacts would be identical to those described for Alternative B because jackpot and/or pile burning would occur in the same footprint and in the same manner for both alternatives. Effects to carbon stock, accumulation of GHG emissions, and changes to the global carbon budget would be negligible under this scenario.

3.14.2.4 Alternative C1 – Preferred Alternative

Potential effects under Alternative C1 would be very similar to Alternatives B and C. Under Alternative C1, 42,000 acres more would be treated compared to Alternative B and 73,000 acres more than Alternative C. Potential impacts to carbon sequestration would be very similar, but slightly higher. Treatment would result in loss of 0.07 Tg more carbon than Alternative B, or a maximum removal of 0.56 Tg carbon stock in junipers over the life of the project (Table 34). This represents roughly 13% of above-ground biomass carbon within the project area, 7% in the BLM Bruneau and Owyhee Field Offices, and 1% in southern Idaho, and much smaller fractions of total ecosystem carbon at the same spatial scales (Table 38).

Table 38 – Proportion of carbon stock removed from above-ground biomass and total ecosystem carbon at three spatial scales (Alternative C1).

Area/Spatial Scale	Above-ground biomass	Total ecosystem
Project Area	12.8%	1.4%
BLM Bruneau and Owyhee Field Offices	6.7%	0.7%
Southern Idaho – Tree Canopy Cover	1.4%	0.1%

GHG emissions from jackpot or pile burning would also be similar to alternatives B and C, but 0.03 Tg more CO2e would be emitted under Alternative C1 compared to Alternatives B or C, for a total of 0.21 Tg CO2e over the life of the project. Potential effects on carbon sequestration and emission of GHG would be slightly higher than for alternatives B or C, but any changes to the global carbon budget would be negligible.

3.15 Social Characteristics

3.15.1 Affected Environment – Social Characteristics

This section describes the existing social characteristics and conditions in the area that would be affected by the project and estimates potential impacts to people and their sense of well-being that could result from project implementation. The analysis area of social-economic-ecological values and for the analysis of potential environmental changes and consequential impacts to people is Owyhee County.

The University of Idaho (Social Analysis Team) conducted research regarding the effects to social values in Owyhee County as a result of this project. The team held meetings and workshops in various locations across Southwest Idaho and with various potential stakeholders and interested public (Bentley Brymer et al. 2016).

Owyhee County is comprised of 76% public land (managed mostly by BLM), 517,000 acres of which is designated wilderness (Bentley Brymer et al. 2016). Agriculture comprises 26.1% of total Owyhee County employment with two-thirds of that sector as ranching (Bentley Brymer et al. 2016). Most ranches are not economically viable with private land alone; these operations rely on permitted grazing on BLM allotments (Bartlett et al. 2002). Although Owyhee County is rural, it is in close proximity to the greater Boise metropolitan area (Mackun & Wilson 2011), and many people travel from the metropolitan area for hunting, fishing, rafting, bird watching, hiking, and OHV riding (among other activities). The large wilderness areas within Owyhee County provide an added layer of complexity, with some stakeholders advocating for multiple-use activities and others preferring preservation or restricted activity (Wulfhorst et al. 2006).

In addition to population characteristics, stakeholders' perceptions of current conditions are included as part of the Affected Environment. That is to say, proposed changes to management can affect perceptions and as such are included in the social impact assessment. Workshop participants expressed value in the social, ecological, cultural, and economic characteristics in project area.

3.15.2 Environmental Consequences – All Alternatives

For all proposed alternatives, workshop participants described 46 environmental changes they expect could occur in the project area as a result of the proposed action and alternatives, and that both social and ecological changes are expected to impact people and their communities positively and negatively. The project is expected to affect social conditions in Owyhee County. The context within and extent to which these effects would occur would vary according to a given perception, whether positive or negative. Among workshop participants, there was very little consensus on which alternative would present the least impacts to the Socio-Economic Character of the project area. Therefore, there was not a measureable and meaningful effect as a result of any one alternative.

3.15.3 Cumulative Impacts – Social Characteristics

A cumulative impacts analysis would not be meaningful since there are no measureable direct or indirect impacts. Also, it may be assumed that the same perceptions associated with juniper treatments would extend to the cumulative actions across the landscape.

3.16 Irreversible or Irretrievable Consequences

The BLM did not identify any irreversible or irretrievable consequences for any resources with implementation of the action alternatives. The light-handed approach to juniper treatment and the project design features ensure that there would be no irreversible and irretrievable consequences.

4.0 Consultation and Coordination

4.1 List of Preparers

Name	Position
Janelle Alleman	Fish Biologist, Boise District
Mike Williamson	Public Affairs, Boise District
Trisha Cracroft	Ecologist, NRCS
Chris Clay	GIS Specialist, Boise District
Sylvia Copeland	Wildlife Biologist, Boise District - Fuels
Kara Kirkpatrick-Kreitinger	NEPA Specialist, Boise District
Lara Hannon	Botanist, Boise District - Fuels
Ryan Homan	Outdoor Recreation Planner, Owyhee Field Office
Karen Kumiega	Archaeologist, Boise District - Fuels
Mike McGee	Project Lead/Resource Coordinator, Boise District
Justin Boeck	Fire Management Specialist (Planning), Boise District - Fire/Fuels
Lance Okeson	Assistant Fire Management Officer, Boise District - Fuels
Kyle Paffett	Hydrologist, Boise District
Michelle Ryerson	Field Office Manager, Owyhee Field Office
Julie Suhr Pierce	Socioeconomic Specialist, Washington Office
Tanya Thrift	Field Office Manager, Bruneau Field Office
Pam Murdock	Planning and Environmental Coordinator, Boise District

4.2 List of Agencies and Organizations Consulted

Affected land owners and permittees
Governor's Office of Species Conservation
Idaho Department of Fish and Game
Idaho Department of Lands
Natural Resources Conservation Service
Owyhee County Commissioners
Owyhee Local Working Group,
Pheasants Forever
Trout Unlimited
The Nature Conservancy
University of Idaho
U.S. Fish and Wildlife Service

4.3 Native American Consultation

The BLM is required to consult with Native American tribes to "help assure that (1) federally recognized tribal governments and Native American individuals, whose traditional uses of public land might be affected by a proposed action, will have sufficient opportunity to contribute to the decision, and (2) the decision maker will give tribal concerns proper consideration" (U.S. Department of the Interior, *BLM Manual Handbook H-8120-1*). Tribal coordination and consultation responsibilities are implemented under laws and executive orders that are specific to cultural resources which are referred to as "cultural resource authorities," and under regulations that are not specific which are termed "general authorities." Cultural resource authorities include: the *National Historic Preservation Act of 1966*, as amended (NHPA); the *Archaeological Resources Protection Act of 1979*; and the *Native American Graves Protection and Repatriation Act of 1990, as amended*. General authorities include: the *American Indian Religious Freedom Act of 1979*; the NEPA; the FLPMA; and *Executive Order 13007-Indian Sacred Sites*. The proposed action is in compliance with the aforementioned authorities.

Southwest Idaho is the homeland of two culturally and linguistically related tribes: the Northern Shoshone and the Northern Paiute. In the latter half of the 19th century, a reservation was established at Duck Valley on the Nevada/Idaho border west of the Bruneau River. Today, the Shoshone-Paiute Tribes residing on the Duck Valley Reservation actively practice their culture and retain aboriginal rights and/or interests in this area. The Shoshone-Paiute Tribes assert aboriginal rights to their traditional homelands as their treaties with the United States, the Boise Valley Treaty of 1864 and the Bruneau Valley Treaty of 1866, which would have extinguished aboriginal title to the lands now federally administered, were never ratified.

Other tribes that have ties to southwest Idaho include the Bannock Tribe and the Nez Perce Tribe. Southeast Idaho is the homeland of the Northern Shoshone Tribe and the Bannock Tribe. In 1867 a reservation was established at Fort Hall in southeastern Idaho. The Fort Bridger Treaty of 1868 applies to BLM's relationship with the Shoshone-Bannock Tribes. The northern part of the BLM's Boise District was also inhabited by the Nez Perce Tribe. The Nez Perce signed treaties in 1855, 1863 and 1868. The BLM considers off-reservation treaty-reserved fishing, hunting, gathering, and similar rights of access and resource use on the public lands for all tribes that may be affected by a proposed action.

The BLM provided an early alert to the Shoshone-Paiute Tribes during the June 19, 2014, Wings and Roots Program, Native American Campfire meeting, and has provided several project updates since the early alert. The BLM also consulted with the Shoshone-Bannock Tribes about the BOSH Project on May 17, 2017.

4.4 Public Participation

The BLM received public scoping comments from the following individuals and entities:

Allen, Michael
American Wild Horse Preservation Campaign
Christman, Dan
Conley, Pam

Dougal, Frankie
Hoagland, Jerry
Fauci, Joanie
Golden Eagle Audubon Society
Idaho Conservation League
Idaho Department of Parks and Recreation
Idaho Office of Species Conservation
Idaho State Department of Agriculture
Miller Land Company
Nettleton, Paul
Owyhee Cattlemen’s Association
Owyhee County Board of Commissioners
Payne, Ted
Ratcliff, Thomas
Schneider, Mark
Soran, Stan
Stanford, Dennis
Thompson, Robyn and Breuer, Ernie
The Nature Conservancy
The Wilderness Society
Western Watersheds Project
Wild Earth Guardians
Wilderness Watch
Wildlands Defense
Weyen, Matt

5.0 Literature Cited

Adams, M. 1960. (Revised Edition 2001) Historic Silver City, the Story of the Owyhees. Owyhee Publishing Company, Homedale, ID.

Aldridge, C.L., S.E. Hanser, S.E. Neilsen, M. Leu, B.S. Cade, D.J. Saher, and S.T. Knick. 2011. Detectability adjusted count models of songbird abundance. Pp. 141-200 *in* S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basin. Allen Press, Lawrence, KS.

Aldridge, C. L. and R. M. Brigham. 2002. Nesting and Reproductive Activities of Greater Sage-Grouse in a Declining Northern Fringe Population. The Condor. 103:3:537-543.

Allen, E. A. and R.S. Nowak. 2008. Effect of Pinyon-Juniper tree Cover on the Soil Seed Bank. Rangeland Ecology and Management. 61(1):63-73.

Anderson, D.E. 2007. Survey Techniques. Chapter 5, pp. 89-100. *In*: Bird, D.M., and K.L. Bildstein (Editors). Raptor Research and Management Techniques Manual. Hancock House Publishers, Blaine, WA.

Anthony, C.R. 2016. Resource Selection and Space Use of Western Long-eared Myotis (*Myotis evotis*) in a Western Juniper (*Juniperus occidentalis*) Woodland of Central Oregon. Thesis, Oregon State University, Corvallis, OR.

Balch, J.K. B.A. Bradley, C.M. D'Antonio, and J. Gomez-Dans. 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980-2009). Global Change Biology 19:173-183. http://dx.doi.org/10.1111/gcb.12046.

Bartlett, E.T., L.A. Torell, N.R. Rimbey, L.W. Van tassel, and D.W. McCollum. 2002. Valuing grazing use on public land. Journal of Range Management 55:426-438.

Barton, D. C. and A. L. Holmes. 2007. Off-highway Vehicle Trail Impacts on Breeding Songbirds in Northeastern California. Journal of Wildlife Management 71:1617-1620.

Baruch-Mordo, S., J.S. Evans, J.P. Severson, D.E. Naugle, J.D. Maestas, J.M. Kiesecker, M.J. Falkowski, C.A. Hagen and K.P. Reese. 2013. Saving sage-grouse from the trees: A proactive solution to reducing a key threat to a candidate species. J Biological Conservation 167 (2013) 223-241.

Bates, J.D., R.F. Miller, and T.J. Svejcar. 2000. Understory dynamics in cut and uncut western juniper woodlands. Journal of Range Management 53:119-126.

Bates, J.D., R.F. Miller, and T.J. Svejcar. 2005. Long-term successional trends following western juniper cutting. Rangeland Ecology and Management 58(5):533-541.

Bates, J.D., R.F. Miller, and K.W. Davies. 2006. Restoration of quaking aspen woodlands invaded by western juniper. Rangeland Ecology and Management 59:88-97.

Bates, J.D., and T.J. Svejcar. 2009. Herbaceous succession after burning of cut western juniper trees. Western North American Naturalist 69:9-25.

Bates, J.D., K.W. Davies and R.N. Sharp. 2011. Shrub-steppe early succession following invasive juniper cutting and prescribed fire. Environmental Management 47:468-481.

Bates, J.D., R.N. Sharp, and K.W. Davies. 2013. Sagebrush steppe recovery after fire varies by development phase of *Juniperus occidentalis* woodland. International Journal of Wildland Fire 23:117–130.

Bates, J.D., R. O'Connor, and K.W. Davies. 2014. Vegetation recovery and fuel reduction after seasonal burning of western juniper. Fire Ecology 10(3):27–48.

Bates, J.D., K.W. Davies, A. Hulet, R.F. Miller, and B. Roundy. 2017. Sage Grouse Groceries: Forb Response to Piñon-Juniper Treatments. Rangeland Ecology and Management 70(1):106-115.

Bechard, M.J., and J.K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). The Birds of North America (P. G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology. Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/ferhaw. DOI: 10.2173/bna.172.https://birdsna.org/Species-Account/bna/species/ferhaw. DOI: 10.2173/bna.172.

Bedell, T.E., L.E. Eddleman, T. Deboodt, and C. Jacks. 1993. Western juniper - its impact and management in Oregon rangelands. Oregon State University Extension Service.

Bentley Brymer, A. L., J. D. Holbrook, R. J. Niemeyer, A. A. Suazo, J. D. Wulfhorst, K. T. Vierling, B. A. Newingham, T. E. Link, and J. L. Rachlow. 2016. A social-ecological impact assessment for public lands management: application of a conceptual and methodological framework. Ecology and Society 21(3):9. Available: http://dx.doi.org/10.5751/ES-08569-210309

Benton, R., and J. Reardon. 2006. Fossils and Fire: A Study of the Effects of Fire on Paleontological Resources at Badlands National Park. Fossils from Federal Lands. New Mexico Museum of Natural History and Science Bulletin 34: 47-54.

Berry, K.H. 1980. A review of the effects of off-road vehicles on birds and other vertebrates. California Desert Plan Program, USDI BLM, Riverside, CA. 18 p.

Beschta, R.L. 1997. Riparian Shade and Stream Temperature: An Alternative Perspective. Rangelands 19(2):25-28.

Bevanger, K. 1998. Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biological Conservation 86:67-76.

Bisson, P.A., B.E. Rieman, C. Luce, P.F. Hessburg, D.C. Lee, J.L. Kershner, G.H. Reeves, and R.E. Gresswell. 2003. Fire and Aquatic Ecosystems of the Western USA: Current Knowledge and Key Questions. Forest Ecology and Management 178:213-229.

Blank, R. R., J. Chambers, B. Roundy, and A. Whittaker. 2007. Nutrient Availability in Rangeland Soils: Influence of Prescribed Burning, Herbaceous Vegetation Removal, Overseeding with *Bromus tectorum*, Season, and Elevation. Rangeland Ecology and Management 60(6): 644-55.

Bradley, B.A., C.A. Curtis, and J.C. Chambers. 2016. *Bromus* response to climate and projected changes with climate change. P. 257-274 in: M.J. Germino, J.C. Chambers, and C.S. Brown (Editors). Exotic brome-grasses in arid and semi-arid ecosystems of the Western US: Causes, consequences and management implications. Springer, New York, NY.

Bradley, B.A., R.A. Houghton, J.F. Mustard, and S.P. Hamburg. 2006. Invasive grass reduces aboveground carbon stocks in shrublands of the Western US. Global Change Biology 12:1815-1822.

Brooks, M. L. and B. Lair. 2005. Ecological Effects of Vehicular Routes in a Desert Ecosystem. Report Prepared for the U.S. Geological Survey, Las Vegas NV. 23 p.

Brown, J.K., E.D. Reinhardt, W.C. Fischer. 1991. Predicting Duff and Woody Fuel Consumption in Northern Idaho Prescribed Fires. Forest Science 37(6):1550-1566.

Buchalski M.R., J.B. Fontaine, P.A. Heady III, J.P. Hayes, and W.F. Frick. 2013. Bat response to differing fire severity in mixed-conifer forest, California, USA. PLoS ONE 8(3): e57884. doi:10.1371/journal.pone.0057884.

Bukowski, B.E., and W.L. Baker. 2013. Historical fire regimes, reconstructed from land-survey data, led to complexity and fluctuation in sagebrush landscapes. Ecological Applications 23:546-564.

Bull, E.L., and M.P. Hayes. 2002. Overwintering of Columbia spotted frogs in northeastern Oregon. Northwest Science 76:141147.

Bull, E.L. 2005. Ecology of the Columbia spotted frog in northeastern Oregon. General Technical Report PNWGTR640. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 46 pp.

Burkhardt, J .W. and E.W. Tisdale. 1976. Causes of juniper invasion in southwestern Idaho. Ecology 76:472-484.

Bury, R.B., R.A. Luckenbach and S.D. Busack. 1977. Effects of off-road vehicles on vertebrates in the California desert USA: Wildlife Research Report no. 8, U.S. Fish and Wildlife Service, Washington, D.C., p. 1–23.

Buseck, R.S., and D.A. Keinath. 2004. "Species assessment for Western long-eared myotis (*Myotis evotis*) in Wyoming." United States Department of Interior, Bureau of Land Management, Cheyenne, WY.

Campbell, J.L., R.E. Kennedy, W.B. Cohen, and R.F. Miller. 2012. Assessing the carbon consequences of western juniper (*Juniperus occidentalis*) encroachment across Oregon, USA. Rangeland Ecology and Management 65:223-231.

Canfield, J.E., L.J. Lyon, J.M. Hillis, and M.J. Thompson. 1999. Ungulates. Pp. 6.1-6.25 in G. Joslin and H. Youmans (Coordinators). Effects of recreation on Rocky Mountain wildlife: a review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society, p. 307.

Casazza et al. 2011. Linking habitat selection and brood success in greater sage-grouse. In: Knick, S.T., and J.W. Connelly (Eds.). Greater sage-grouse: ecolongy and conservation of a landscape species and its habitat. University of California Press, Berkeley, CA. pp. 185-202.

Cederholm, C.J., L.M. Reid, and E.O. Salo. 1981. Cumulative effects of logging road sediment on salmonid populations in the Clearwater River, Jefferson County, Washington. Presented to the conference Salmon-Spawning Gravel: A Renewable Resource in the Pacific Northwest? 6-7 October 1980 Seattle Washington. 35 pp.

Chambers, J.C., J.L. Beck, J.B. Bradford, J. Bybee, S. Campbell, J. Carlson, T.J. Christiansen, K.J. Clause, G. Collins, M.R. Crist, J.B. Dinkins, K.E. Doherty, F. Edwards, S. Espinsoa, K.A. Griffin, P. Griffin, J.R. Haas, S.E. Hanser, D.W. Havlina, K.F. Henke, J.D. Hennig, L.A. Joyce, F.F. Kilkenny, S.M. Kulpa, L.L. Kurth, J.D. Maestas, M. Manning, K.E. Mayer, B.A. Mealor, C. McCarthy, M. Pellant, M.A. Perea, K.L. Prentice, D.A. Pyke, L.A. Wiechman, and A. Wuenschel. 2017. Science framework for conservation and restoration of the sagebrush biome: Linking the Department of the Interior's Integrated Rangeland Fire Management Strategy to long-term strategic conservation actions. Part 1. Science basis and applications. Gen. Tech. Rep. RMRS-GTR-360. 213 p. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Chambers, J.C., J.L. Beck, S. Campbell, J. Carlson, T.J. Christiansen, K.J. Clause, J.B. Dinkins, K.E. Doherty, K.A. Griffin, D.W. Havlina, K.F. Henke, J.D. Hennig, L.L. Kurth, J.D. Maestas, M. Manning, K.E. Mayer, B.A. Mealor, C. McCarthy, M.A. Perea, and D.A. Pyke. 2016. Using resilience and resistance concepts to manage threats to sagebrush ecosystems, Gunnison sage-grouse, and Greater sage-grouse in their eastern range: A strategic multi-scale approach. Gen. Tech. Rep. RMRS-GTR-356. 143 p. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Chambers, J.C., D.A. Pyke, J.D. Maestas, M. Pellant, C.S. Boyd, S.B. Campbell, S. Espinosa, D.W. Havlina, K.E. Mayer, A. Wuenschel. 2014. Using resistance and resilience concepts to reduce impacts of invasive annual grasses and altered fire regimes on the sagebrush ecosystem and greater sage-grouse: A strategic multi-scale approach. Gen. Tech. Rep.

RMRS-GTR-326. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 73 pp.

Chambers, J., B. Roundy, R. Blank, S. Meyer, and A. Whittaker. 2007. What Makes Great Basin Sagebrush Ecosystems Invasible by Bromus tectorum? Ecological Monographs 77(1):117-145.

Canfield, J. E., L. J. Lyon, J. M. Hillis and M. J. Thompson. 1999. Ungulates. Chapter 6 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coordinated by G. Joslin and H. Youmans. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society.

Chung-MacCoubrey, A.L. 2005. Use of pinyon-juniper woodlands by bats in New Mexico. Forest Ecology and Management 204:209–220.

Cline, N.L., B.A. Roundy, F.B. Pierson, P. Kormos, and C.J. Williams. 2010. Hydrologic response to mechanical shredding in a juniper woodland. Rangeland Ecology and Management 63(4):467-477.

Coates, P.S., B.G. Prochazka, M.A. Rica, K.B. Gustafson, P. Ziegler, and M.L. Casazza. 2017. Pinyon and juniper encroachment into sagebrush ecosystems impacts distribution and survival of greater sage-grouse. Rangeland Ecology and Management 70:25-38.

Collopy, M.W. 1983. A comparison of direct observations and collections of prey remains in determining the diet of Golden Eagles. Journal of Wildlife Management 47:360–368.

Connelly, J.W., S.T. Knick, M.A. Schroeder and S.J. Stiver. 2004. Conservation Assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, WY.

Connelly, J.W., A. Moser, and D. Kemner, 2013. Greater sage-grouse breeding habitats: Landscape-based comparisons. Grouse News. Newsletter of the Grouse Group of the IUCN SSC-WPA Galliformes Specialist Group 45:4-8.

Connelly, J.W., K.P. Reese, and M.A. Schroeder. 2003. Monitoring of greater sage-grouse habitats and populations. Station Bulletin 80, College of Natural Resources Experiment Station, College of Natural Resources, University of Idaho, Moscow, ID, p. 54.

Connelly, J.W., E.T. Rinkes, and C.E. Braun. 2011. Characteristics of greater sage-grouse habitats. Pp. 69-83 in Knick, S.T., and J.W. Connelly (Eds.). Greater sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology No. 38. University of California Press, Berkeley, CA.

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.

Cox, M., D.W. Lutz, T. Wasley, M. Fleming, B.B. Compton, T. Keegan, D. Stroud, S. Kilpatrick, K. Gray, J. Carlson, L. Carpenter, K. Urquhart, B. Johnson, and C. McLaughlin. 2009. Habitat Guidelines for Mule Deer: Intermountain West Ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

Crist, M.R., S.T. Knick, and S.E. Hanser. 2015. Range-wide network of priority areas for greater sage-grouse—A design for conserving connected distributions or isolating individual zoos?. U.S. Geological Survey Open-File Report 2015-1158, 34 p. Available: https://pubs.er.usgs.gov/publication/ofr20151158

Davies, K.W., C.S. Boyd, J.L. Beck, J.D. Bates, T.J. Svejcar, and M.A. Gregg. 2011. Saving the sagebrush sea: an ecosystem conservation plan for big sagebrush plant communities. Biological Conservation 144:2573–2584.

Dobkin, D.S., and J.D. Sauder. 2004. Shrubsteppe landscapes in jeopardy. Distributions, abundances, and the uncertain future of birds and small mammals in the Intermountain West. High Desert Ecological Research Institute, Bend, OR.

Doherty, K.E., D.E. Naugle, B.L. Walker, and J.M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management 72:187-195.

Doherty, K.E., D.E. Naugle, and B.L. Walker. 2010. Greater Sage Grouse Nesting Habitat: The Importance of Managing at Multiple Scales. Journal of Wildlife Management 74(7):1544-1553.

Donnelly, J.P., D.E. Naugle, C.A. Hagen, and J.D. Maestas. 2016. Public lands and private waters: scarce mesic resources structure land tenure and sage-grouse distributions. Ecosphere 7(1):e01208. 10.1002/ecs2.1208.

Donnelly, J.P., J.D. Tack, K.E. Doherty, D.E. Naugle, B.W. Allred, and V.J. Dreitz. 2017. Extending conifer removal and landscape protection strategies from sage-grouse to songbirds, a range-wide assessment. Rangeland Ecology and Management 70:95-105.

eBird. 2017. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. [2017, March 22].

Edgel, R.J., Pierce, J.L. and Larsen, R.T., 2014. Pygmy rabbit (*Brachylagus idahoensis*) habitat selection: does sagebrush (Artemisia spp.) age influence selection? Western North American Naturalist 74(2), pp.145-154.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The Birder's Handbook. Simon and Shuster, New York.

Environmental Protection Agency (EPA). 1996. Section 13.1 Wildfires and Prescribed Burning in AP 42, Fifth Edition. Compilation of Air Pollutant Emission Factors. Volume I: Stationary Point and Area Sources. Office of Air Quality Planning and Standards, Office of Air and

Radiation, U.S. Environmental Protection Agency, Research Triangle Park, NC. Available: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s01.pdf. [2017, July 28]

Environmental Protection Program (EPA). 2017. Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2015. U.S. Environmental Protection Agency Report EPA 430-P-17-001.

Falkowski, M.J., J.S. Evans, D.E. Naugle, C.A. Hagen, S.A. Carleton, J.D. Maestas, A. Henareh Khalyani, A.J. Poznanovic, and A.J. Lawrence. 2017. Mapping tree canopy cover in support of proactive prairie grouse conservation in western North America. Rangeland Ecology and Management 70:15-24.

Farzan, S., D. Young, A. Dedrick, M. Hamilton, E. Porse, P.S. Coates, and G. Sampson. 2015. Western juniper management: Assessing policies for improving greater sage-grouse habitat and rangeland productivity. Journal of Environmental Management 56:675-683.

FIAT. 2014. Greater sage-grouse wildfire, invasive annual grasses and conifer expansion assessment (Fire and Invasive Assessment Tool). Prepared by Fire and Invasive Assessment Team. 43 pp.

Fleischner, T.L. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8(3):629-644.

Fremgen, A.L., C.T. Rota, C.P. Hansen, M.A. Rumble, R.S. Gamo, and J.J. Millspaugh. 2017. Male greater sage-grouse movements among leks. Journal of Wildlife Management 81:498-508.

Gedney, D.R., D.L. Azuma, C.L. Bolsinger and N. McKay. 1999. Western Juniper in Eastern Oregon. USDA Forest Service General Technical Report PNW-GTR-464. Pacific Northwest Research Station.

Germino, M.J., J. Belnap, J.M. Stark, E.B. Allen, and B.M. Rau. 2016. Chapter 3: Ecosystem Impacts of Exotic Annual Invaders in the Genus *Bromus.* in: M.J. Germino et al. (Editors). Exotic Brome-Grasses in Arid and Semiarid Ecosystems of the Western U.S. Springer International Publishing, Switzerland.

Gibson, D., E. J. Blomberg, M. T. Atamian, and J. S. Sedinger. 2016. Nesting habitat selection influences nest and early offspring survival in Greater Sage-Grouse. The Condor. 118(4):689-702.

Glenn, N.F. and C.D. Finley. 2009. Fire and vegetation type effects on soil hydrophobicity and infiltration in the sagebrush-steppe: I. Field analysis. Journal of Arid Environments. (2009) doi:10.1016/j.jaidenv.2009.009.

Global Carbon Budget. 2016. Carbon budget and trends 2016. Available at: www.globalcarbonproject.org/carbonbudget. Published on 14 November 2016. Accessed on 25 July 2017.

Global Forest Resources Assessment. 2010. Main Report. Food and Agriculture Organization of the United Nations, Rome, Italy. FAO Forestry Paper 163, 340 pp.

Graham, S.E. 2013. Greater sage-grouse habitat selection and use patterns in response to vegetation management practices in northwestern Utah. Thesis, Utah State University, Logan, UT. Available: http://digitalcommons.usu.edu/etd/1971

Grayson, D.K. 2006. The Late Quaternary biogeographic histories of some Great Basin mammals (western USA). Quaternary Science Reviews 25(21):2964-2991.

Great Basin Landscape Conservation Cooperative. 2016. List of Supported Projects. Available at: https://greatbasinlcc.org/supported-projects.

Groves, C.R., R. Butterfield, A. Lippincott, B. Csuti, and J.M. Scott. 1997. Atlas of Idaho's wildlife: integratingg ap analysis and natural heritage information. Nongame and Endangered Wildlife Program,Idaho Department of Fish and Game, Boise, Idaho, USA.

Guzy, M.J., and P.E. Lowther. 2012. Black-throated Gray Warbler (*Setophaga nigrescens*). The Birds of North America (P.G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology. Retrieved from: https://birsna.org/Species-Account-bna/species/btywar

Hahn, T.P. 1996. Cassin's Finch (*Haemorhous cassinii*). The Birds of North America (P.G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology. Retrieved from: https://birdsna.org/Species-Account/bna/species/casfin

Hall, Frederick C. 2001. Photo point monitoring handbook: part A—field procedures. Gen. Tech. Rep. PNW-GTR-526. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p. 2 parts.

Hanni, D.J., C.M. White, N.J. Van Lanen, J.J. Birek, J.M. Berven, and M.F. McLaren. 2015. Integrated Monitoring in Bird Conservation Regions (IMBCR): Field protocol for spatially-balanced sampling of landbird populations. Unpublished report. Rocky Mountain Bird Observatory, Brighton, Colorado, USA.

Hanser, S.E. and S.T. Knick. 2011. Greater Sage-grouse as an umbrella species for shrubland passerine birds: a multiscale assessment. Pp. 472-487 in S. T. Knick and J. W. Connelly (Editors). Greater Sage-grouse: Ecology and Conservation of a Landscape Species and Its Habitats. Studies in Avian Biology No. 38, University of California Press, Berkeley, CA.

Hardy, Colin C. 1996. Guidelines for Estimating Volume, Biomass, and Smoke Production for Piled Slash. USDA Forest Service Technical Report PNW-GTR-364. Pacific Northwest Research Station.

Havlick, D.G. 2002. No place distant: roads and motorized recreation on America's public lands. Washington, DC: Island Press.

Heath, L.S., J.E. Smith, K.E. Skog, D.J. Nowak, and C.W. Woodall. 2011. Managed forest carbon estimates for the U.S. Greenhouse Gas Inventory, 1990-2008. Journal of Forestry 109:167-173.

Hiler, J. 2005. Snake River Country Trappers, Traders, and Mountain Men. In Early Owyhee County, Number 36. Owyhee Outpost: A Journal of the History of the Owyhee Country. A publication of the Owyhee County Historical Society. Owyhee Publishing Company, Homedale, Idaho.

Hillman, T.W., M.D. Miller, and B.A. Nishitani.1999. Evaluation of Seasonal Cold-Water Temperature Criteria prepared for the Idaho Division of Environmental Quality. BioAnalysts, Inc. 3653 Rickenbacker, Suite 200, Boise, ID 83705. Available on line: https://www.deq.idaho.gov/media/528710-seasonal_cold_water_temp.pdf

Hilty, J.H, J.L. Eldridge, R. Rosentreter, M.C. Wicklow-Howard, and M. Pellant. 2004. Recovery of biological soil crusts following wildfire in Idaho. Journal of Range Management 57:89-96.

Holloran, M.J., and S.H. Anderson. 2005. Spatial distribution of greater sage-grouse nests in relatively contiguous sagebrush habitats. The Condor 107. 4:742-752.

Holmes, A.L., J.D. Maestas, and D.E. Naugle. 2017. Bird responses of removal of western juniper in sagebrush steppe. Rangeland Ecology and Management 70:87-94.

Houghton, R.A., J.L. Hackler, and K.T. Lawrence. 2000. Changes in terrestrial carbon storage in the United States. 2: The role of fire and fire management. Global Ecology and Biogeography 9:145-170.

Hovick, T.J., R.D. Elmore, D.K. Dahlgren, S.D. Fuhlendorf, and D.M. Engle. 2014. Evidence of negative effects of anthropogenic structures on wildlife: a review of grouse survival and behavior. Journal of Applied Ecology 51:1680-1689.

Idaho Department of Fish and Game (IDFG). 2016. 2016 Sage-grouse Population Triggers Analysis. Prepared by IDFG, Boise, ID. September 19, 2016. Page 14.

Idaho Department of Fish and Game (IDFG). 2017. Idaho State Wildlife Action Plan, 2015. Boise (ID): Idaho Department of Fish and Game. Grant No.: F14AF01068 Amendment #1. Available from: http://fishandgame.idaho.gov/. Sponsored by the US Fish and Wildlife Service, Wildlife and Sport Fish Restoration Program. Updated 28 January 2017.

Idaho Fish and Wildlife Information System (IFWIS). 2017. Species Diversity Database, Idaho Natural Heritage Program, March 3, 2017. Idaho Department of Fish and Game, Boise, ID.

Idaho Sage-grouse Advisory Committee (ISAC). 2006. Conservation Plan for the Greater Sage-grouse in Idaho.
Available at: https://idfg.idaho.gov/old-web/docs/wildlife/sageGrouse/conservPlan.pdf

Idaho State Department of Agriculture (ISDA). 2005. Idaho's Strategic Plan for Managing Noxious and Invasive Weeds. Idaho State Department of Agriculture.

James, L., J. Evans, M. Ralphs and R. Child (Editors). 1991. Noxious Range Weeds. Westview Press. Boulder, CO.

Katzner, T.E. and K.L. Parker. 1997. Vegetative characteristics and size of home ranges used by pygmy rabbits (*Brachylagus idahoensis*) during winter. Journal of Mammalogy 78:1063-1072.

Kershner, E.L., and W.G. Ellison. 2012. Blue-gray Gnatcatcher (*Polioptila caerulea*). The Birds of North America. Ithaca: Cornell Lab of Ornitholgy. Retrieved from: https://birdsna.org/Species-Account/bna/species/buggna.

Knick, S.T. and J.T. Rotenberry. 1995. Landscape Characteristics of Fragmented Shrubsteppe Habitats and Breeding Passerine Birds. Conservation Biology, 9: 1059–1071.

Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. Van Riper III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor 105:611-634.

Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements or distribution of greater sage-grouse leks: implications for population connectivity across their western range, USA. Ecology and Evolution 3: 1539–1551.

Kochert, M.N., K. Steenhof, C.L. McIntyre, and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). The Birds of North America (P.G. Rodewald, Ed.). Cornell Lab of Ornithology, Ithaca, NY. Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/goleag.

Kormos, P.R., D. Marks, F.B. Pierson, C.J. Williams, S.P. Hardegree, S. Havens, A. Hedrick, J.D. Bates, and T. J. Svecjar. 2017. Ecosystem water availability in Juniper versus sagebrush snow-dominated rangelands. Rangeland Ecology and Management 70: 116-128.

Kreye, J.K., N.W. Brewer, P. Morgan, J.M. Varner, A.M.S. Smith, C.M. Hoffman, R.D. Ottmar. 2014. Fire Behavior in Masticated Fuels: A review. Forest Ecology and Management (314, pp. 193-207).

Kunkel, K.E., L.E. Stevens, S.E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K.T. Redmond, and J.G. Dobson. 2013. Regional climate trends and scenarios for the U.S. National Climate Assessment. Part 6. Climate of the Northwest U.S. NOAA Tech. Rep. NESDIS 142-6. U.S. Department of Commerce, Oceanic and Atmospheric Administration, Washington D.C. 79 p.

Larrucea, E.S., and P.F. Brussard. 2008. Habitat selection and current distribution of the pygmy rabbit in Nevada and California, USA. Journal of Mammalogy, 89: 691–699.

Leu, M. S.E. Hanser, C.L. Aldridge, S.E. Neilsen, L.H. Suring, and S.T. Knick. 2011. Occurrence of large and medium-sized mammals: occurrence but not count models predict pronghorn distribution. Pp. 315-336 *in* S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basin. Allen Press, Lawrence, KS.

Lohr, K., and B. Haak. 2009. Columbia Spotted Frog Great Basin Population (Owyhee Subpopulation) Long-term Monitoring Plan; Year 2009 Results. Idaho Dept. of Fish and Game, Progress Report, Threatened and Endangered Species Project E-26-6 and E-26-7.

Lowther, P.E., C. Celada, N.K. Klein, C.C. Rimmer, and D.A. Spector. 1999. Yellow Warbler (*Setophaga petechia*). The Birds of North America (P.G. Rodewald, Ed.). Cornell Lab of Ornithology. Retrieved from: https://birdsna.org/Species-Account/bna/species/yelwar.

Luckenbach, R.A., and R.B. Bury. 1983, Effects of off-road vehicles on the biota of the Algodones Dunes, Imperial County, California, USA: Journal of Applied Ecology, 20(1): 265-286.

Mac, M.J., P.A. Opler, E.P. Haecker and P.D. Doran. 1998. Status and trends of the nation's biological resources. Vol. 2. USDI, United States Geological Survey, Reston, VA.

Mackun, P. J., and S. Wilson. 2011. Population distribution and change: 2000 to 2010. U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, Washington, D.C., USA. Available: https://www.census.gov/prod/cen2010/briefs/c2010br-01.pdf

Major, D.J., J. Murgoito, P. Makela, and E. Ellsworth. 2016. Draft 2015 Landscape Importance Model (LIM) for use in SATRFIRE, and other Greater Sage-grouse landscape conservation efforts. Update to Makela and Major 2012 to identify characterize priority areas at a landscape level. Version 29 January, 2016. Bureau of Land Management, Idaho State Office, Boise, ID.

Makela, P., and D. Major. 2012. A framework to identify greater sage-grouse preliminary priority habitat and preliminary general habitat for Idaho. Bureau of Land Management, Idaho State Office, Resources and Science Branch, Boise, ID. 41 pages.

Manning, R.W., and J.K. Jones, Jr. 1989. Mammalian Species No. 329, pp. 1-5. Myotis evotis. Published by The American Society of Mammalogists.

Matney, C.A., C.S. Boyd, and T.K. Stringham. 2005. Use of Felled Junipers to Protect Streamside Willows from Browsing. Rangeland Ecology and Management 58:652-655.

McGrath C.L., Woods A.J., Omernik, J.M., Bryce, S.A., Edmondson, M., Nesser, J.A., Shelden, J., Crawford, R.C., Comstock, J.A., and Plocher, M.D. 2002. Ecoregions of Idaho (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,350,000).

McIver, J., M. Brunson, S. Bunting, J. Chambers, P. Doescher, J. Grace, and J. Williams. 2014. A Synopsis of Short-Term Response to Alternative Restoration Treatments in Sage-brush-Steppe: The SageSTEP Project. Rangeland Ecology and Management, 67(5), 584-598. doi: 10.2111/REM-D-14-00084.1

Marler, P., M. Konishi, A. Lutjen, and M.S. Waser. 1973. Effects of Continuous Noise on Avian Hearing and Vocal Development. Proc. Nat. Acad. Sci., 70(5): 1393-1396.

Matney, C. A., C. S. Boyd, and T. K. Stringham. 2005. Use of felled junipers to protect streamside willows from browsing. Rangeland Ecology and Management 58:652–655.

Miller, R.F**.,** R. Tausch, and W. Waichler. 1999**.** Old-growth juniper and pinyon woodlands. pp. 375-384. *In*: Monsen, S.B., S. Richards, R.J. Tausch, R.F. Miller, C. Goodrich, (comp.); Proc. - Ecology and Management of Pinyon-Juniper Communities within the Interior West. USDA For. Ser., RMRS-P-9.

Miller, R.F., T. Svejcar, and J.A. Rose. 2000. Impacts of western juniper on plant community composition and structure. Journal Range Management. 53:574-585.

Miller, R.F. and R.J. Tausch. 2001. The role of fire in pinyon and juniper woodlands: a descriptive analysis. Tall Timbers. Pp.15-30, *In* K. Galley and T. Wilson (Eds.), Fire Conference 2000: The First National Congress on Fire, Ecology, Prevention and Management. Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species. Tallahassee: Tall Timbers Research Station. Miscellaneous publication no. 11. p. 15–30.

Miller, R.F., J.D. Bates, T.J. Svejcar, F.B. Pierson, L.E. Eddleman. 2005. Biology, ecology, and management of western juniper (*Juniperus occidentalis*). Oregon State University Agricultural Experiment Station Technical Bulletin 152, Corvallis, OR.

Miller, R.F., R.J. Tausch, E. McArthur, E. Durant, D.D. Johnson, and S.C. Sanderson. 2008. Age structure and expansion of piñon-juniper woodlands: a regional perspective in the Intermountain West. Res. Pap. RMRS-RP-69. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 15 pp.

Miller, R.F., S.T. Knick, D.A. Pyke, C.W. Meinke, S.E. Hanser, M.J. Wisdom, and A.L. Hild. 2011. Characteristics of sagebrush habitats and limitations to long-term conservation. Pp.145-184 in S.T. Knick and J.W. Connelly, editors, Greater Sage-grouse Ecology and Conservation of a Landscape Species and Its Habitats. Cooper Ornithological Society, Studies in Avian Biology No. 38. Univ. California Press, Berkeley.

Miller, R.F., J.C. Chambers, D.A. Pyke, F.B. Pierson, and C.J. Williams. 2013. A review of fire effects on vegetation and soils in the Great Basin Region: response and ecological site characteristics. Gen. Tech. Rep. RMRS-GTR-308. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 126 p.

Miller, R.F., J. Ratchford, B.A. Roundy, R.J. Tausch, C. Pereia, A. Hulet, and J. Chambers. 2014a. Response of conifer encroached shrublands in the Great Basin to prescribed fire and mechanical treatments. Rangeland Ecology and Management 67:468-481.

Miller, R.F., J.C. Chambers, and M. Pellant. 2014b. A field guide for selecting the most appropriate treatment in sagebrush and pinyon-juniper ecosystems in the Great Basin: Evaluating resilience to disturbance and resistance to invasive annual grasses and predicting vegetative response. Gen. Tech. Rep. RMRS-GTR-322. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 66p.

Miller, R.F., D.E. Naugle, J.D. Maestas, C.A. Hagen, and G. Hall. 2017. Targeted woodland removal to recover at-risk grouse and their sagebrush-steppe and prairie ecosystems. Rangeland Ecology and Management 70:1-8.

Mollnau, C., M. Newton, and T. Stringham. 2014. Soil water dynamics and water use in a western juniper (*Juniperus occidentalis*) woodland. Journal of Arid Environments 102, 117–126.

Mosconi, S.L., and R.L. Hutto. 1982. The effect of grazing on the land birds of a western Montana riparian habitat. P. 221-233 in J.M. Peek and P.D. Dalke (Eds). Wildlife-livestock relationships symposium: Proceedings 10. University of Idaho, Forest, Wildlife and Range Experiment Station, Moscow, Idaho. 614 pp.

Munger, J.C., M. Gerber, M. Carroll, K. Madric, and C. Peterson. 1996. Status and habitat associations of the spotted frog (*Rana pretiosa*) in southwestern Idaho. Bureau of Land Management Technical Bulletin No. 961. Boise, Idaho. 112 pp.

NatureServe. 2002. Element occurrence data standard. NatureServe in cooperation with the Network of Natural Heritage Programs and Conservation Data Centers, Rosslyn, VA. 201 pp.

Noson, A.C., R.A. Schmitz and R.F. Miller. 2006. Influence of fire and juniper encroachment on birds in high-elevation sagebrush steppe. Western North American Naturalist, 66(3):343-353.

Oregon State University (OSU). 1995. Western Juniper: Its Impact and Management in Oregon Rangelands. Extension Service. EC1417. pp 16.

O’Shea, T.J., P.M. Cryan, E.A. Snider, E.W. Valdez, L.E. Ellison, and D.J. Neubaum. 2011. Bats of Mesa Verde National Park, Colorado: composition, reproduction, and roosting habits. Monographs of the Western North American Naturalist, Volume 5, Article 1. Available at: http://scholarsarchive.byu.edu/mwnan/vol5/iss1/1

Ottmar, R.D. 2014. Wildland fire emissions, carbon, and climate: Modeling fuel consumption. Forest Ecology and Management 317:41-50.

Ottmar, R.D.; Vihnanek, R.E.; Wright, C.S.; Restaino, J.C. 2009. Photo series for quantifying natural fuels. Volume XI: eastern Oregon sagebrush. General Technical Report PNW-GTR-XXX. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 43 p. Available: https://depts.washington.edu/nwfire/dps/

Ottmar, R.D.; Vihnanek, R.E; Wright, C.S. 1998. Stereo photo series for quantifying natural fuels: Volume I: Mixed-conifer with mortality, western juniper, sagebrush, and grassland types in the interior Pacific Northwest. PMS 830. NFES 2580. Boise, Idaho: National Wildfire Coordinating Group. National Interagency Fire Center (NIFC). 73 p. Available: https://depts.washington.edu/nwfire/dps/

Ouren, D.S., C. Haas, C.P. Melcher, S.C. Stewart, N.R. Ponds, L. Burris, T. Fancher, and Z.H. Bowen. 2007. Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources: U.S. Geological Survey, Open-File Report 2007-1353, 225p.

Owyhee County Sage-grouse Local Working Group (OLWG). 2000. Sage-grouse Management Plan, as amended (2013), Owyhee County, Idaho.

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. Interim golden eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Bird Management, U.S. Fish and Wildlife Service.

Paige, C., and S.A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Boise, Idaho: Partners in Flight Western Working Group.

Pan, Y., R.A. Birdsey, J. Fang, R. Houghton, P.E. Kauppi, W.A. Kurz, O.L. Phillips, A. Shvidenko, S.L. Lewis, J.G. Canadell, P. Ciais, R.B. Jackson. S.W. Pacala, A.D McGuire, S. Piao, A. Rautianinen, S. Sitch, and D. Hayes. 2011. A large and persistent carbon sink in the world's forests. Science. 333:988-993.

Patten, M.A., E. Shochat, D.L. Reinking, D.H. Wolfe, and S.K. Sherrod. 2006. Habitat edge, land management, and rates of brood parasitism in tallgrass prairie. Ecological Applications 16:687-695.

Peterson, R. 1995. Confronting the Desert. In Snake The Plain and its People. Boise State University, Boise, ID.

Pierce, J.E., R.T. Larsen, J.T. Flinders, and J.C. Whiting. 2011. Fragmentation of sagebrush communities: does an increase in habitat edge impact pygmy rabbits? Animal Conservation, 14(3):314-321.

Pierson, F.B., J.D. Bates, T.J. Svejcar, and S.P. Hardegree. 2007. Runoff and erosion after

cutting western juniper. Rangeland Ecology and Management 60(3):285-292.

Pierson, F.B., C.J. Williams, P.R. Kormos, S. P. Hardegree, P.E. Clark, and B.M. Rau. 2010. Hydrologic vulnerability of sagebrush steppe following pinyon and juniper encroachment. Rangeland Ecology and Management 63:614–629.

Pierson, F.B., C.J. Williams, S.P. Hardegree, P.E. Clark, P.R. Kormos, and O.Z. Alhamdan. 2013. Hydrologic and erosion responses of sagebrush steppe following juniper encroachment, wildfire, and tree-cutting. Rangeland Ecology and Management 66:274–289.

Pierson, F.B., C. J. Williams, P.R. Kormos, O.Z. Al-Hamdan, S.P. Hardegree, and P.E. Clark. 2015. Short-term impacts of tree removal on runoff, and erosion from pinyon- and juniper-dominated sagebrush hillslopes. Rangeland Ecology and Management 68:408-422.

Plew, M.G. 2008. The Archaeology of the Snake River Plain, Second Edition. Department of Anthropology, Boise State University, Boise, ID.

Poznanovic, A.J., M.J. Falkowski, A.L. Maclean, A.M.S. Smith, and J.S. Evans. 2014. An accuracy assessment of tree detection algorithms in juniper woodlands. Photogrammatic Engineering and Remote Sensing 80:627-637.

Prater, M.R., D. Obrist, J.A. Amone III, and E.H. DeLucia. 2006. Net carbon exchange and evapotranspiration in postfire and intact sagebrush communities in the Great Basin. Oecologia 146:595-607.

Prochazka, B.G., P.S. Coates, M.A. Ricca, M.L. Casazza, K.B. Gustafson, and J.M. Hull. 2017. Encounters with pinyon-juniper influence riskier movements in greater sage-grouse across the Great Basin. Rangeland Ecology and Management 70:39-49.

Pyke, D.A. 2011. Restoring and rehabilitating sagebrush habitats. Pages 531–548 in S.T. Knick and J.W. Connelly, editors, Greater Sage-grouse Ecology and Conservation of a Landscape Species and Its Habitats. Cooper Ornithological Society, Studies in Avian Biology No. 38. Univ. California Press, Berkeley.

Rachlow, J., and L. Svancara. 2003. Pygmy Rabbit Habitat in Idaho. Project Completion Report, Challenge Cost Share, University of Idaho, Moscow, ID.28 pp.

Rachlow, J., and L. Svancara. 2006. Prioritizing Habitat For Surveys Of An Uncommon Mammal: A Modeling Approach Applied To Pygmy Rabbits. Journal of Mammalogy, 87(5):827-833.

Rantz, S.E. 1982. Measurement and Computation of Stream Flow: Volume 1, Measurement of Stage and Discharge, U.S. Geological Survey Water Supply Paper 2175. U.S. Government Printing Office, Washington, D.C.

Rau, B.M., R. Tausch, A. Reiner, D.W. Johnson, J.C. Chambers, and R.R. Blank. 2012. Developing a model framework for predicting effects of woody expansion and fire on ecosystem carbon and nitrogen in a pinyon-juniper woodland. Journal of Arid Environments 76:97-104.

Reinhardt, J. R., D. E. Naugle, J. D. Maestas, B. Allred, J. Evans, and M. Falkowski. 2017. Next-generation restoration for sage-grouse: a framework for visualizing local conifer cuts within a landscape context. Ecosphere 8(7): e01888. 10.1002/ecs2.1888

Reinkensmeyer, D.P., R.F. Miller, R.G. Anthony and V.E. Marr. 2007. Avian community structure along a mountain big sagebrush successional gradient. The Journal of Wildlife Management 71(4):1057-1066.

Richardson, C. 2006. Pronghorn Habitat Requirements. Pages 5-12 in K.A. Cearley and S. Nelle, editors. Pronghorn Symposium 2006. Texas Cooperative Extension, College Station, USA.

Rieman, B., D. Lee, G. Chandler and D. Meyers. 1995. Does Wildfire Threaten Extinction for Salmonids? Responses of Redband Trout and Bull Trout Following Recent Large fires on the Boise National Forest. In Proceedings: First Conference on Fire Effects on Rare and Endangered Species and Habitats, Coeur d'Alene, Idaho, November 1995. Fairfield, WA. International Association of Wildland Fire, c 1997: pp 47-57.

Robertson, J.M., and W.C. Funk. 2012. Population genetic analysis of Columbia spotted frogs (*Rana luteiventris*) in southwestern Idaho. Final Report submitted to Bureau of Land Management, Boise, Idaho. Colorado State University, Fort Collins, Colorado. September 30, 2011. Pp. 8 and 19.

Robinson, D.A., I. Lebron, R.J. Ryel, and S.B. Jones. 2010. Soil Water Repellency: A Method of Soil Moisture Sequestration in Pinyon-Juniper Woodland. Soil Sci. Soc. Am. J. Vol. 74, pp. 624-634.

Rosenberg, K.V., J.A. Kennedy, R. Dettmers, R.P. Ford, D. Reynolds, J.D. Alexander, C.J. Beardmore, P.J. Blancher, R.E. Bogart, G.S. Butcher, A.F. Camfield, A. Couturier, D.W. Demarest, W.E. Easton, J.J. Giocomo, R.H. Keller, A.E. Mini, A.O. Panjabi, D.N. Pashley, T.D. Rich, J.M. Ruth, H. Stabins, J. Stanton, and T. Will. 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee.

Rosenberger, A.E., J.B. Dunham, J.R. Neuswanger, and S.F. Railsback. 2015. Legacy Effects of Wildfire on Stream Thermal Regimes and Rainbow Trout Ecology: An Integrated Analysis of Observation and Individual-based Models. Freshwater Sci. Vol. 24, pp. 1.

Roundy, B.A., R.F. Miller, R.J. Tausch, K. Young, A. Hulet, B. Rau, B. Jessop, J.C. Chambers, and D. Eggett. 2014a. Understory cover responses to piñon-juniper treatments across tree dominance gradients in the Great Basin. Rangeland Ecology and Management 67:482-494.

Roundy, B.A., K. Young, N. Cline, A. Hulet, R.F. Miller, R.J. Tausch, and B. Rau. 2014b. Pinon-juniper reduction increases soil water availability of the resource growth pool. Rangeland Ecology and Management 67:495–505.

Rowland, M.M., and M. Leu. 2011. Study area description. Chapter 1 in S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basins. Allen Press, Lawrence, KS.

Rowland, M.M., L.H. Suring, M. Leu, S.T. Knick, and M.J. Wisdom. 2011. Sagebrush-associated species of conservation concern. Pp. 46-68 in S.E. Hanser, M. Leu, S.T. Knick, and C.L. Aldridge (editors). Sagebrush ecosystem conservation and management: ecoregional assessment tools and models for the Wyoming Basins. Allen Press, Lawrence, KS.

Sage Grouse Initiative. 2015a. Sagebrush songbirds benefit from sage grouse habitat restoration. Science to Solutions Series Number 9. Sage Grouse Initiative. 4pp.

Sage Grouse Initiative. 2015b. Sage Grouse Conservation Benefits Migratory Mule Deer. Science to Solutions Series Number 6.

Sampson, M.P. 2007. Effects of Off-Highway Vehicles on Archaeological Sites in Red Rock Canyon. California Department of Parks and Recreation. http://www.parks.ca/gov/?page_id=24576.

Sandford, C., and T.A. Messmer. 2014. Effects of pinyon juniper removal on greater sage-grouse (*Centrocercus urophasianus*) habitat-use and vital rates in northwestern Utah. 2014 Annual Report (DWR Contract 132573), Utah State University, Logan, Utah, pp. 1–14.

Sankey, T., R. Shrestha, J.B. Sankey, S. Hardegree, and E. Strand. 2013. Lidar-derived estimate and uncertainty of carbon sink in successional phases of woody encroachment. Journal of Geophysical Research: Biogeosciences 118:1144-1155.

Sauer, J.R., D.K. Niven, J.E. Hines, D.J. Ziolkowski, Jr, K.L. Pardieck, J.E. Fallon, and W.A. Link. 2017. The North American Breeding Bird Survey, Results and Analysis 1966 - 2015. Version 2.07.2017 USGS Patuxent Wildlife Research Center, Laurel, MD.

Schlossberg, S., and J.C. Sterling. 2013. Gray flycatcher (*Empidonax wrightii*). The Birds of North America. Ithaca: Cornell Lab of Ornithology. Retrieved from: https://birdsna.org/Species-Account/bna/gryfll

Schmalz, J.M., B. Wachocki, M. Wright, S.I. Zeveloff and M.M. Skopec. 2014. Habitat selection by the pygmy rabbit (*Brachylagus idahoensis*) in northeastern Utah. Western North American Naturalist, 74(4), 456-466.

Scott, J. H and R.E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive

set for use with Rothermel’s surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Schroder, S.-A. 2002. A Synthesis of Previous Studies that Explored the Effects of Fire on Obsidian: Where We’ve Been and Where We’re Going. In “The Effects of Fire and Heat on Obsidian” Assembled and Edited by Janine M. Loyd, Thomas M. Origer and David A. Fredrickson, June 2002, DOI, BLM Cultural Resources Publication, Anthropology-Fire History.

Schroeder, M.A., J.R. Young, and C.E. Braun. 1999. Sage Grouse (*Centrocercus urophasianus*). In The Birds of North America, No. 425 (A. Poole and F. Gill, Editors). The Birds of North America, Inc., Philadelphia. PA.

Schulz, T.T., and W.C. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43:295-299.

Severson, J.P., C.A. Hagen, J.D. Maestas, D.E. Naugle, J.T. Forbes, and K.P. Reese. 2017a. Effects of conifer expansion on greater sage-grouse nesting habitat selection. Journal of Wildlife Management 81:86-95.

Severson, J.P., C.A. Hagen, J.D. Maestas, D.E. Naugle, J.T. Forbes, and K.P. Reese. 2017b. Short-term response of sage-grouse nesting to conifer removal in the Northern Great Basin. Rangeland Ecology and Management 70:50-58.

Severson, J.P., C.A. Hagen, J.D. Tack, J.D. Maestas, D.E. Naugle, J.T. Forbes, and K.P. Reese. 2017c. Better living through conifer removal: a demographic analysis of sage-grouse vital rates. PLoS ONE 12(3):e0174347.

Sheley, R. and J. Peteroff (Editors). 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press. Corvallis, OR.

Smith, J.P., and S.J. Slater. 2009. Nesting ecology of raptors in northwest Utah: 1998-2007. HawkWatch International, Salt Lake City, UT. Available at: https://hawkwatch.org/images/stories/Conservation_Science/Publications_and_Reports/Technical_Reports_-_Past_Projects/HWI_NW_UT_10yr_raptor_report_2009.pdf.

Snider, E.A., P.M. Cryan, and K.R. Wilson. 2013. Roost selection by western long-eared myotis (*Myotis evotis*) in burned and unburned piñon–juniper woodlands of southwestern Colorado. Journal of Mammalogy 94:640–649.

Steenhof, K., J.L. Brown, and M.N. Kochert. 2014. Temporal and spatial changes in golden eagle reproduction in relation to increased off highway vehicle activity. Wildlife Society Bulletin 38:682-688.

Stevens, B.S., K.P. Reese, J.W. Connelly, and D.D. Musil. 2012. Greater sage-grouse and fences: does marking reduce collisions? Wildlife Society Bulletin 36:297-303.

Steward, J.H. 1938. Basin-Plateau Aboriginal Sociopolitical Groups. Smithsonian Institution, Bureau of American Ethnology Bulletin 120.Reprint 1997 The University of Utah Press, Salt Lake City, UT.

Still, S.M., and B.A. Richardson. 2015. Projections of contemporary and future climate niche for Wyoming big sagebrush (*Artemisia tridentata* subsp. *wyomingensis*): A guide for restoration. Natural Areas Journal 35:30-43.

Stiver, S.J., A.D. Apa, J.R. Bohne, S.D. Bunnell, P.A. Deibert, S.C. Gardner, M.A. Hilliard, C.W. McCarthy, and M.A. Schroeder. 2006. Greater Sage-Grouse Comprehensive Conservation Strategy. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, WY.

Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance and J.W. Karl (editors). 2015. Sage-Grouse Habitat Assessment Framework: A Multiscale Assessment Tool. Technical Reference 6710-1. Bureau of Land Management and Western Association of Wildlife Agencies, Denver, Colorado.

Strand, E.K., L.A. Vierling, A.M.S. Smith, and S.C. Bunting. 2008. Net changes in aboveground woody carbon stock in western juniper woodlands, 1946-1998. Journal of Geophysical Research 113: G01013, doi.10.1029/2007JG000544.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L. Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative, Washington, D.C., USA.

Szewczak, J.M., S.M. Szewczak, M.L. Morrison, and L.S. Hall. 1998. Bats of the White and Inyo Mountains of California-Nevada. Great Basin Naturalist 58:66-75.

Tanhua, T., J.C. Orr, L. Lorenzoni, and L. Hansson. 2015. Monitoring ocean carbon and ocean acidification. World Metereological Organization Bulletin Vol. 64(1), 2 March 2015.

Tattersall, G.J., and G.R. Ultsch. 2008. Physiological ecology of aquatic overwintering in Ranid frogs. Biological Reviews 83:119140.

Taylor, M.H., K. Rollins, M. Kobayashi, and R.J. Tausch. 2013. The economics of fuel management: Wildfire, invasive plants, and the dynamics of sagebrush rangelands in the western United States. Journal of Environmental Management 126:157-173.

Tirmenstein, D. 1999. Juniperus occidentalis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences

Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/plants/tree/junocc/all.html [2017, July 11].

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18-30.

University of Idaho. 2017. Grazing and Sage-Grouse Research. A Research Initiative in Idaho. Available online at: https://idahograusegrazing.wordpress.com/. Accessed March 7, 2017.

USDA Forest Service. 2006. Effects of organic matter removal and soil compaction on fifth-year mineral soil carbon and nitrogen contents for sites across the United States and Canada. https://www.fs.usda.gov/treesearch/pubs/31871 [2017, December 19].

USDA Forest Service. 2017. Fire and Environmental Research Applications Team. Fuel and Fire Tools (FFT). Available: https://www.fs.fed.us/pnw/fera/fft/consumemodule.shtml [2017, July 25].

USDA Natural Resources Conservation Service. 1996. RCA ISSUE Brief #11. Available: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/?cid=nrcs143_014199 [2017, July 18].

USDA Natural Resources Conservation Service. 2015. Natural Resources Conservation Service. Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov/ [2017, April 30].

USDA Natural Resources Conservation Service. 2015. Ecological Site Descriptions. Natural Resources Conservation Service. Available on line at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/ecoscience/desc/

USDI BLM and USDA Forest Service. 2015a. Idaho and Southwestern Montana Sub-regional Greater Sage-Grouse Approved Resource Management Plan Amendment. Pp. 2-19 and 2-20.

USDI BLM and USDA Forest Service. 2015b. Idaho and Southwestern Montana Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement; Chapter 4 – Environmental Consequences.

USDI BLM. 1969. Juniper Mountain Wildlife Habitat Management Plan. Owyhee Upland Planning Unit. I-1 WHA T-1. 26pp.

USDI BLM. 1983. Bruneau Management Framework Plan. Bureau of Land Management.

USDI BLM. 1991. Wilderness Study Report. Volume 1. Pp. 21, 31, 42, 53, and 64.

USDI BLM. 1999. Owyhee Resource Management Plan. Bureau of Land Management.

USDI BLM. 2006. Summary of Livestock Grazing Impacts on Archaeological Sites Located on BLM-Administered Lands in Colorado. On file at the Boise District BLM office.

USDI BLM. 2007. Vegetation Treatments Using Herbicides on Bureau of Land Management Land Lands in 17 Western States Programmatic Environmental Impact Statement. Volume 1: Abstract, Executive Summary, and Chapters 1 through 8.

USDI BLM 2010. Seasonal Wildlife Restrictions and Procedures for Processing Requests for Exceptions on Public Lands in Idaho. Information Bulletin ID-2010-039. BLM Idaho State Office, Boise, ID.

USDI BLM. 2012. Manual 6330. Management of Wilderness Study Areas. Published July 13, 2012.

USDI BLM. 2015. Information Memorandum for the Washington Office. Status of Greater Sage-Grouse Population and Habitat Adaptive Management Triggers within Idaho Biological Significant Units in 2016. BLM Idaho State Office.

USDI BLM and USDI Geological Survey. 2001. Biological Soil Crusts: Ecology and Management. BLM Technical Reference 1730-2. Contributors: J. Belnap, J. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge.

USDI Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. Division of Migratory Bird Management, Arlington, VA. 85 pp. Available at http://www.fws.gov/migratorybirds/.

USDI Fish and Wildlife Service. 2010a. Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered. Federal Register, 75 FR 13910 14014.

USDI Fish and Wildlife Service. 2010b. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Pygmy Rabbit as Endangered or Threatened. Federal Register, 75 FR 60516 60561.

USDI Fish and Wildlife Service. 2013a. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, CO. February 2013.

USDI Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Review of Natives Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Federal Register, 79 CFR 72450 72497.

USDI Fish and Wildlife Service. 2015a. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List Greater Sage-Grouse (*Centrocercus urophasianus*) as an Endangered or Threatened Species; Proposed Rule. Federal Register, 80 CFR 59858 59941.

USDI Fish and Wildlife Service. 2015b. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petitions to List 19 Species as an Endangered or Threatened Species. 80 CFR 60834 60850.

USDI Geological Survey. 2013. National Gap Analysis Program—Species Viewer. Available at: https://gapanalysis.usgs.gov/species/viewer/. Accessed March 7, 2017. Accessed March 7, 2017.

USDI National Park Service. 1991. How to Apply the National Register Criteria for Evaluation. National Park Service, National Register Bulletin #15.

Vonhof, M.J., and R.M.R. Barclay. 1996. Roost-site selection and roosting ecology of forest-dwelling bats in southern British Columbia. Canadian Journal of Zoology 74:1797-1805.

WAWFA. 2015. Greater Sage-Grouse Population Trends: An Analysis of Lek Count Databases 1965-2015. Western Association of Fish and Wildlife Agencies, Cheyenne, WY.

Wakkinen, W.L., K.P. Reese and J.W. Connelly. 1992. Sage Grouse Nest Locations in Relations to Leks. Journal of Wildlife Management 56:381-383.

Welch, N.E., and J.A. MacMahon. 2005. Identifying habitat variables important to the rare Columbia spotted frog in Utah (U.S.A.): an information-theoretic approach. Conservation Biology 19:473481.

Western Bat Working Group (WBWG). 2017. Western Bat Species Information. http://wbwg.org/western-bat-species/#. [2017, March 16].

Whitaker, J.O., Jr. 1998. National Audubon Society Field Guide to North American Mammals. Alfred A. Knopf, Inc., New York, NY.

Wiedinmyer, C., and J.C. Neff. 2007. Estimates of CO2 from fires in the United States: implications for carbon management. Carbon Balance and Management. 2:10.

Wiedinmeyer, C., and M. D. Hurtteau. 2010. Prescribed fire as a means of reducing carbon emissions in the Western United States. Enivon. Sci Technol. 2010. 44, 1926-1936.

Wiens, J.A., and J.T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21–41.

Williams, C.J., F.B. Pierson, O.Z. Al-Hamdan, P.R. Kormos, S.P. Hardegree, and P.E. Clark. 2013. Can wildfire serve as an ecohydrologic threshold-reversal mechanism on juniper-encroached shrublands? Ecohydrology DOI: 10.1002/eco.1364.

Williams, R.E., B.A. Roundy, A. Hulet, R.F. Miller, R.B. Tausch, J.C. Chambers, J. Matthews, R. Schooley, D. Eggett. 2017. Pretreatment tree dominance and conifer removal treatments

affect plant succession in sagebrush communities. Rangeland Ecology and Management (2017). In Press. Available: http://dx.doi.org/10.1016/j.rama.2017.05.007

Winterfeld, G.F. and R.A. Rapp (Editors). 2009. Survey of Idaho Fossil Resources Volume 2: Boise BLM District. On file at the Boise BLM Office (Not for public disclosure).

Wisdom, M.J., A.A. Ager, H.K. Preisler, N.J. Cimon and B.K. Johnson. 2004. Effects of off-road recreation on mule deer and elk. In: Transactions of the 69th North American Wildlife and Natural Resources Conference: 531-550.

Wisdom, M.J., M.M. Rowland and L.H. Suring (Editors). 2005. Habitat Threats in the Sagebrush Ecosystem: Methods of Regional Assessment and Applications in the Great Basin. Allen Press, Lawrence, KS.

Wisdom, M. J., and J. C. Chambers. 2009. A landscape Approach for Ecologically Based Management of Great basin Shrublands. Restoration Ecology, 17(5):740-749

Wood PJ, Armitage PD. 1997. Biological effects of fine sediment in the lotic environment. Environ. Manage. 21:203-17

Woods, B.A., J.L. Rachlow, S.C. Bunting, T.R. Johnson and K. 2013. Managing High-Elevation Sagebrush Steppe: Do Conifer Encroachment and Prescribed Fire Affect Habitat for Pygmy Rabbits? Rangeland Ecology and Management, 66(4), 462-471.

Wright, C.S., A.M. Evans, K.A. Haubensak. 2015. How Do Pile Age and Season of Burn Influence Combustion and Fire Effects? Final Report to the Joint Fire Science Program Project Number: 11-1-8-4.

Yoakum, J.D. 1974. Pronghorn habitat requirements for sagebrush grasslands. Proceedings of the Pronghorn Antelope Workshop 6: 16-24.

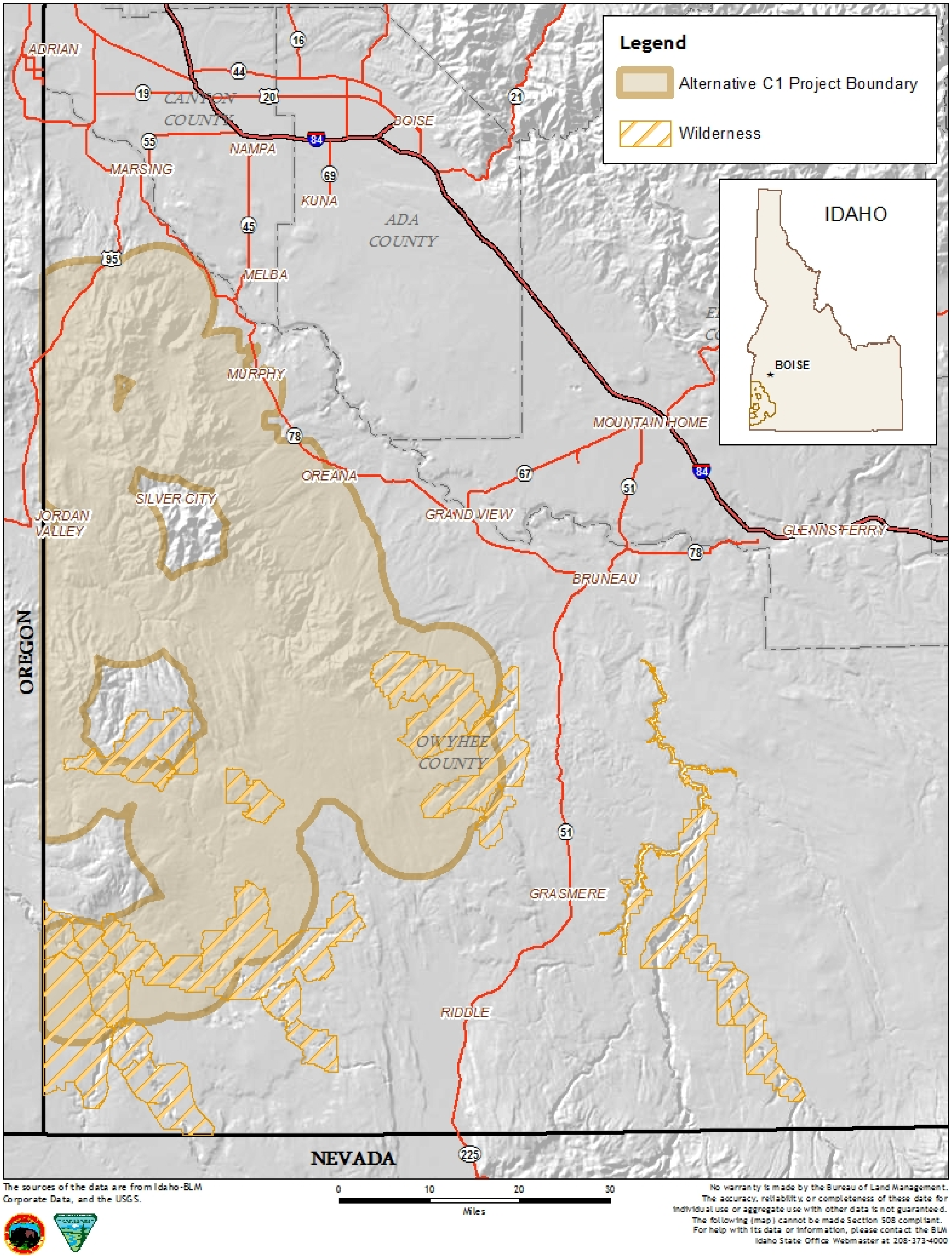
Yoakum, J. 1980. Habitat management guides for the American pronghorn antelope. Technical Note 347. Denver: US Department of the Interior, Bureau of Land Management. 78 pp.

Young, K.R., B.A. Roundy, and D.L. Eggett. 2014. Mechanical Mastication of Utah Juniper Encroaching Sagebrush Steppe Increases Inorganic Soil N. Applied and Environmental Soil Science. Hindawi Publishing Company. Vol. 2014, Article ID 632757. 10pp. Available: http://dx.doi.org/10.1155/2014/632757.

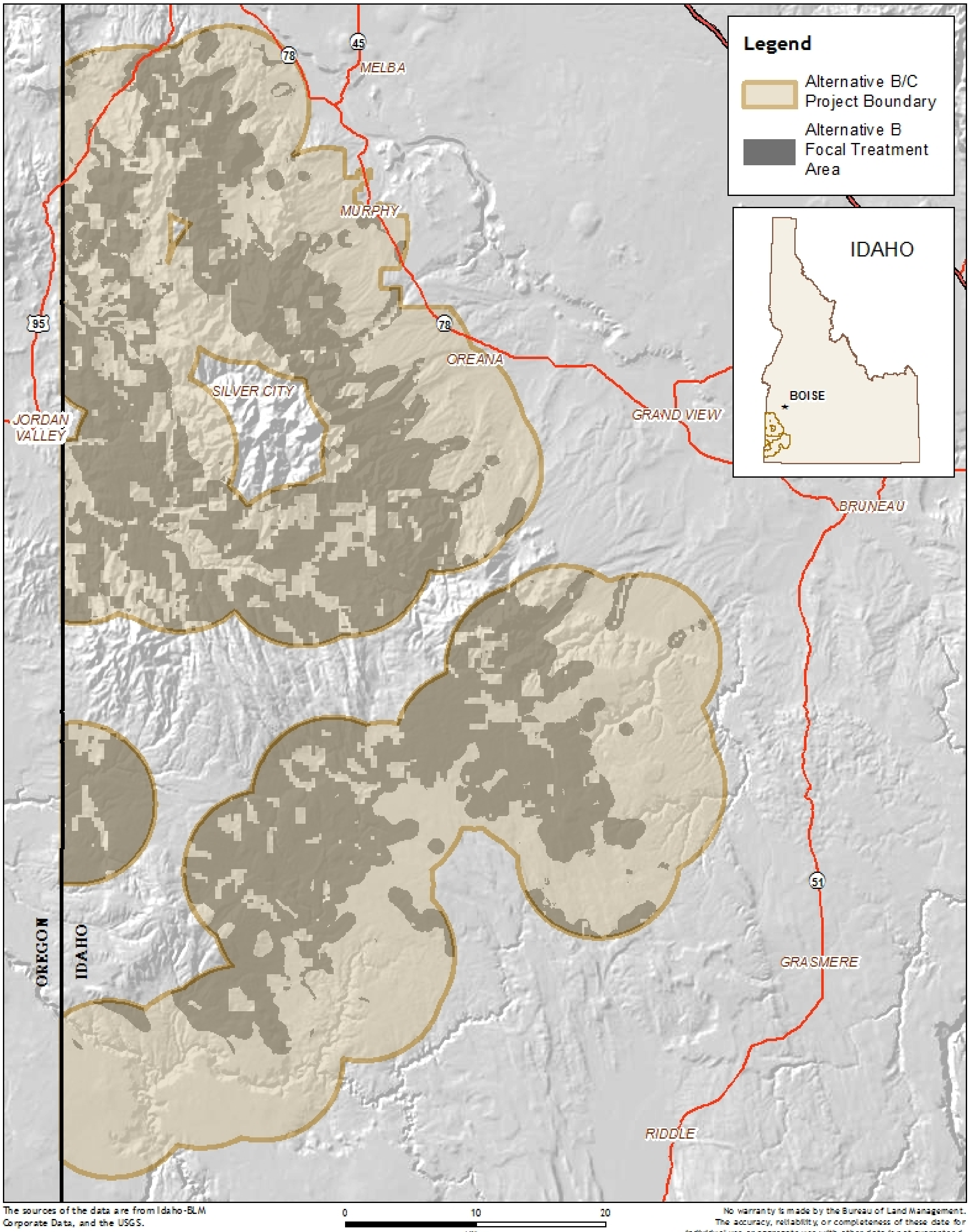
Zhu, Z., and B.C. Reed (Editors). 2012. Baseline and projected carbon storage and greenhouse gas fluxes in ecosystems of the western United States. U.S. Geological Survey Professional Paper 1797, 192 p.

6.0 Maps

1. Project Area Overview



2. Alternative B



The sources of the data are from Idaho-BLM Corporate Data, and the USGS.

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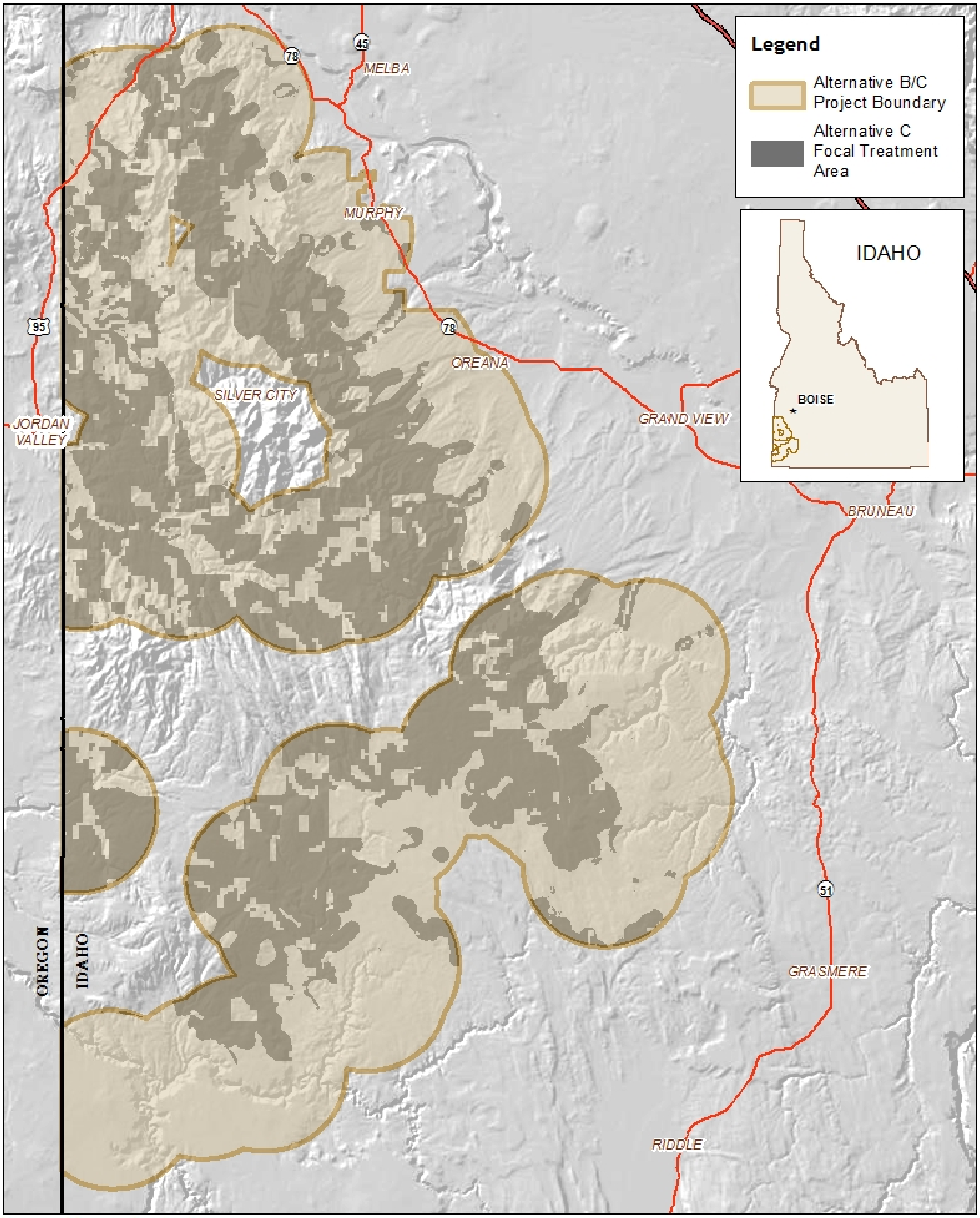
3. Alternative C



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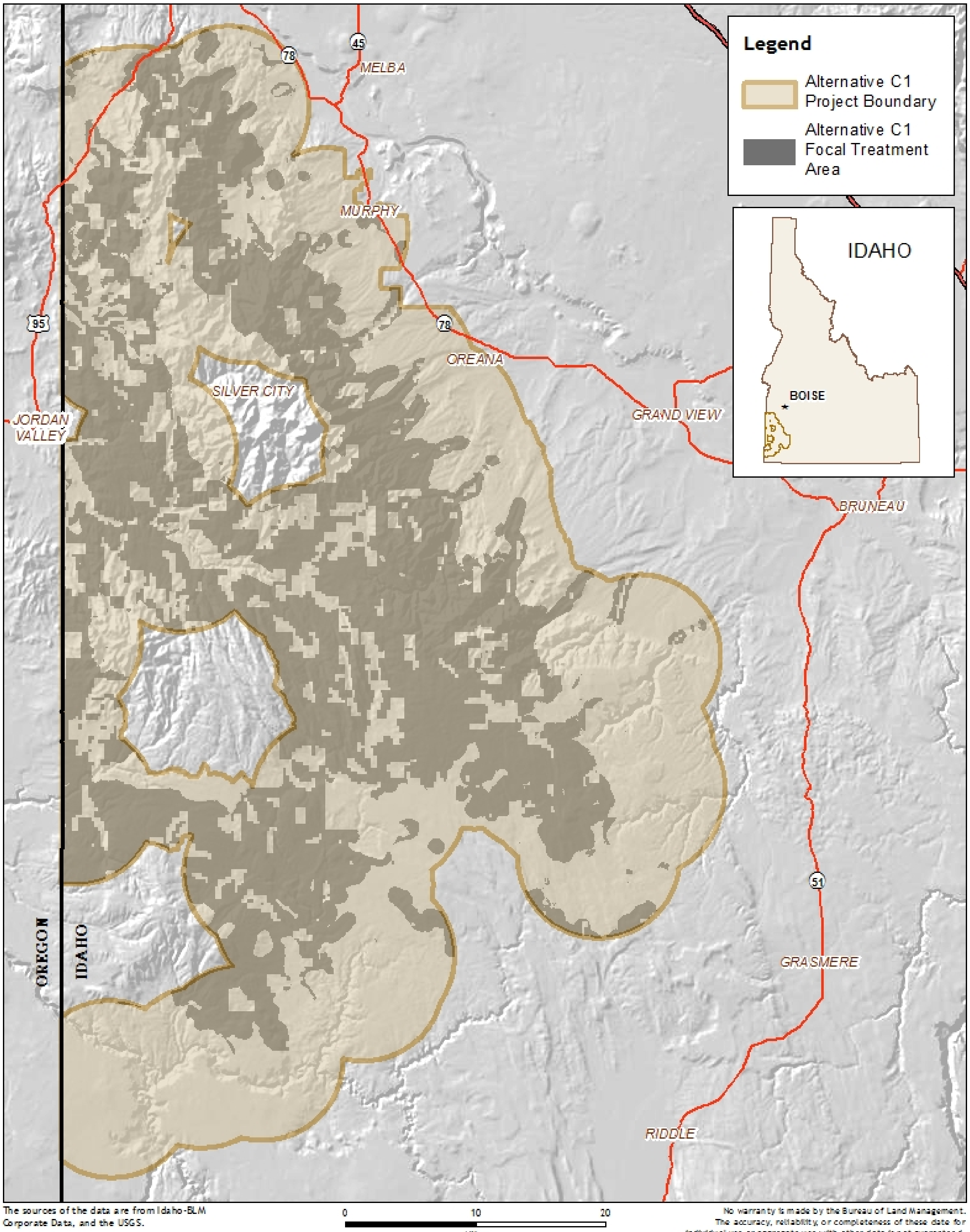
4. Alternative C1



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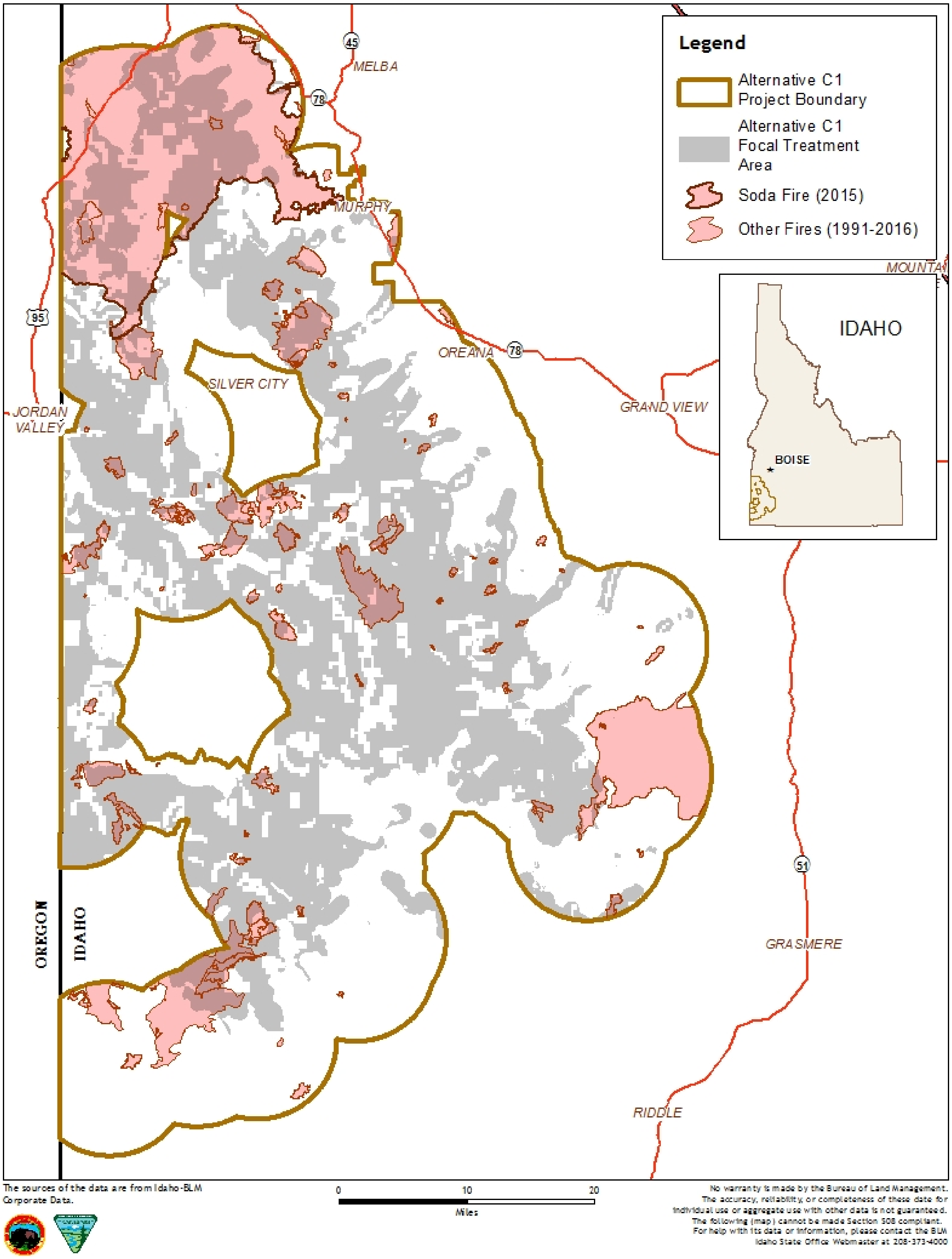
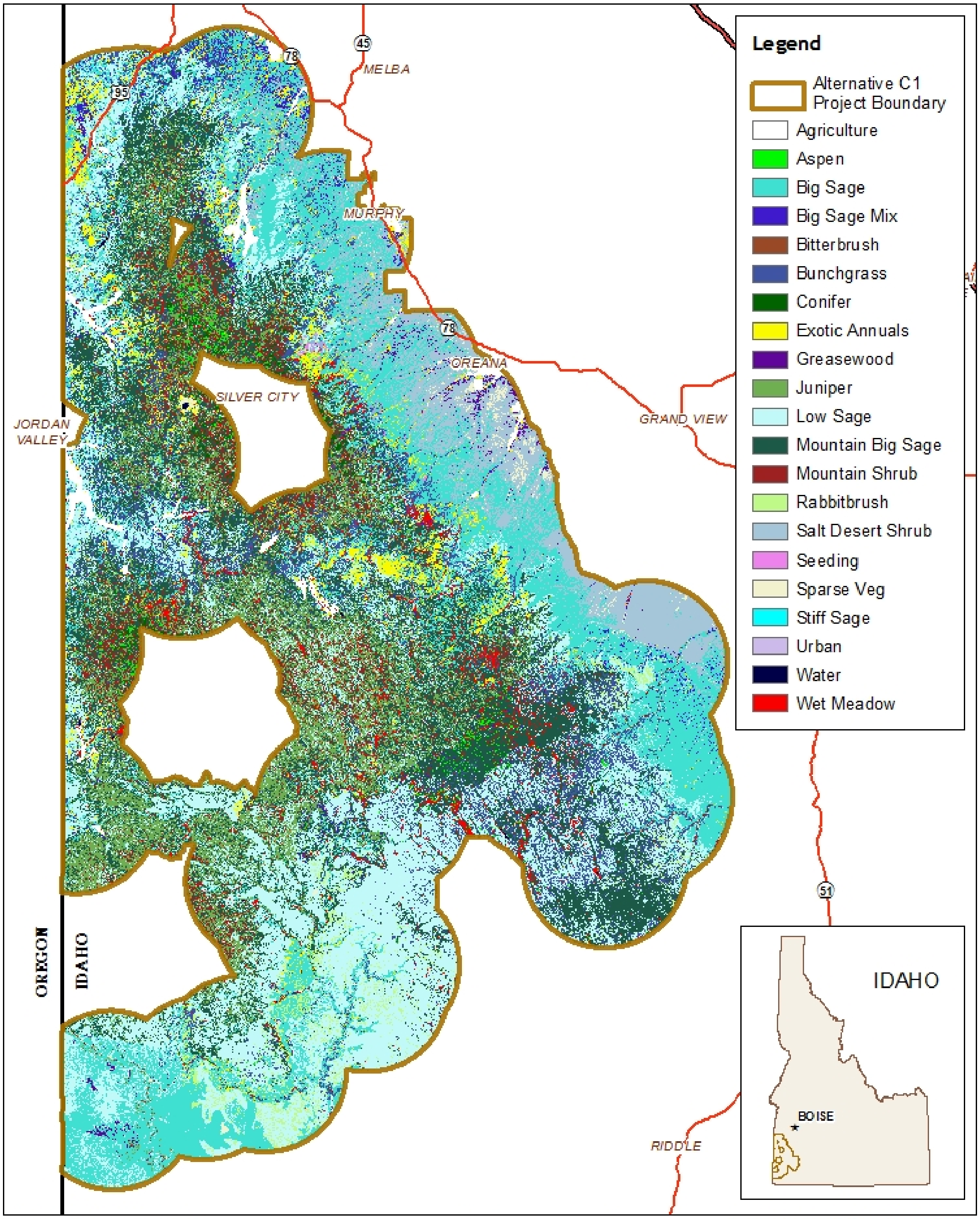
5. Fire History (1991-2016) in the Project Area



6. General Vegetation Cover Types in Project Area



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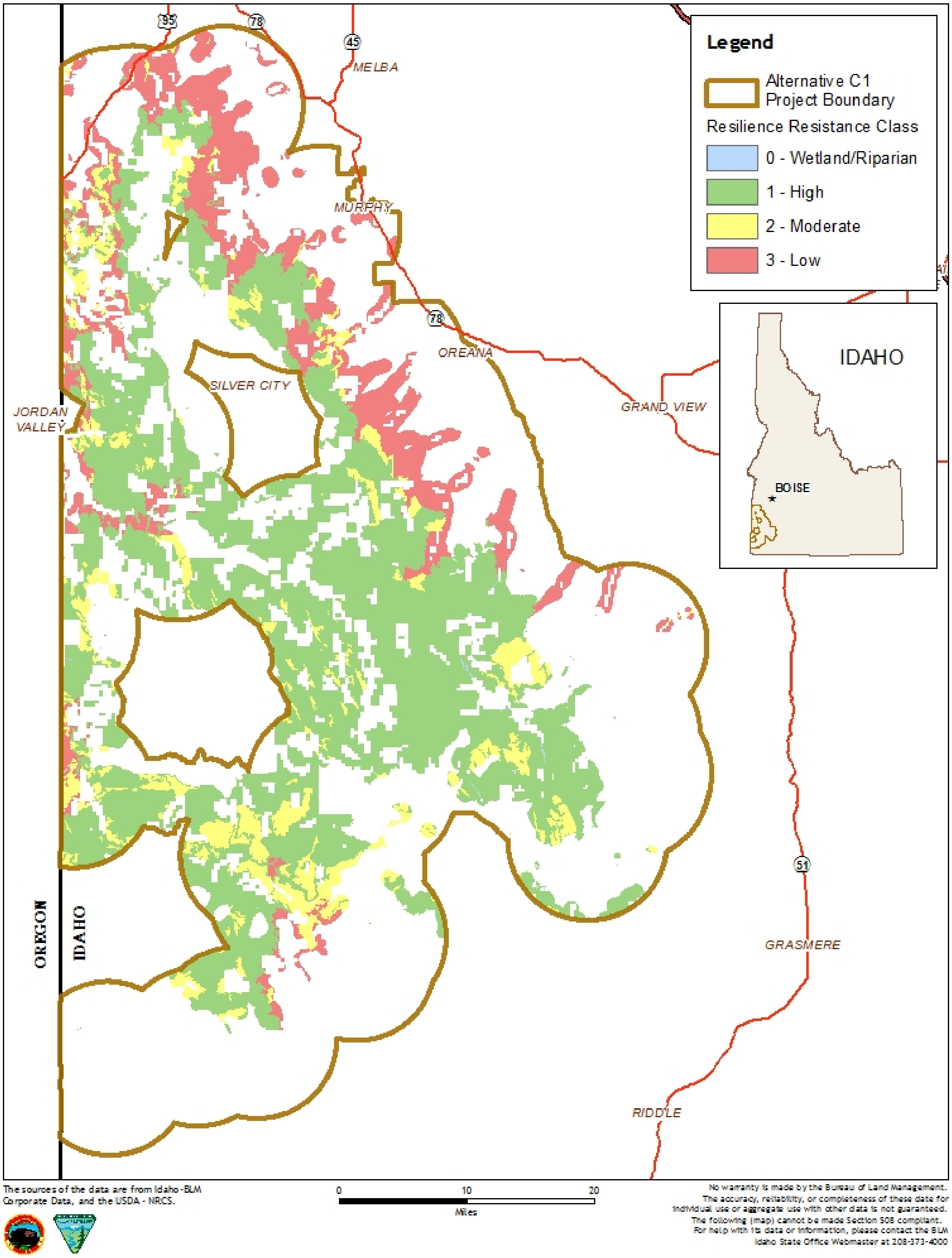
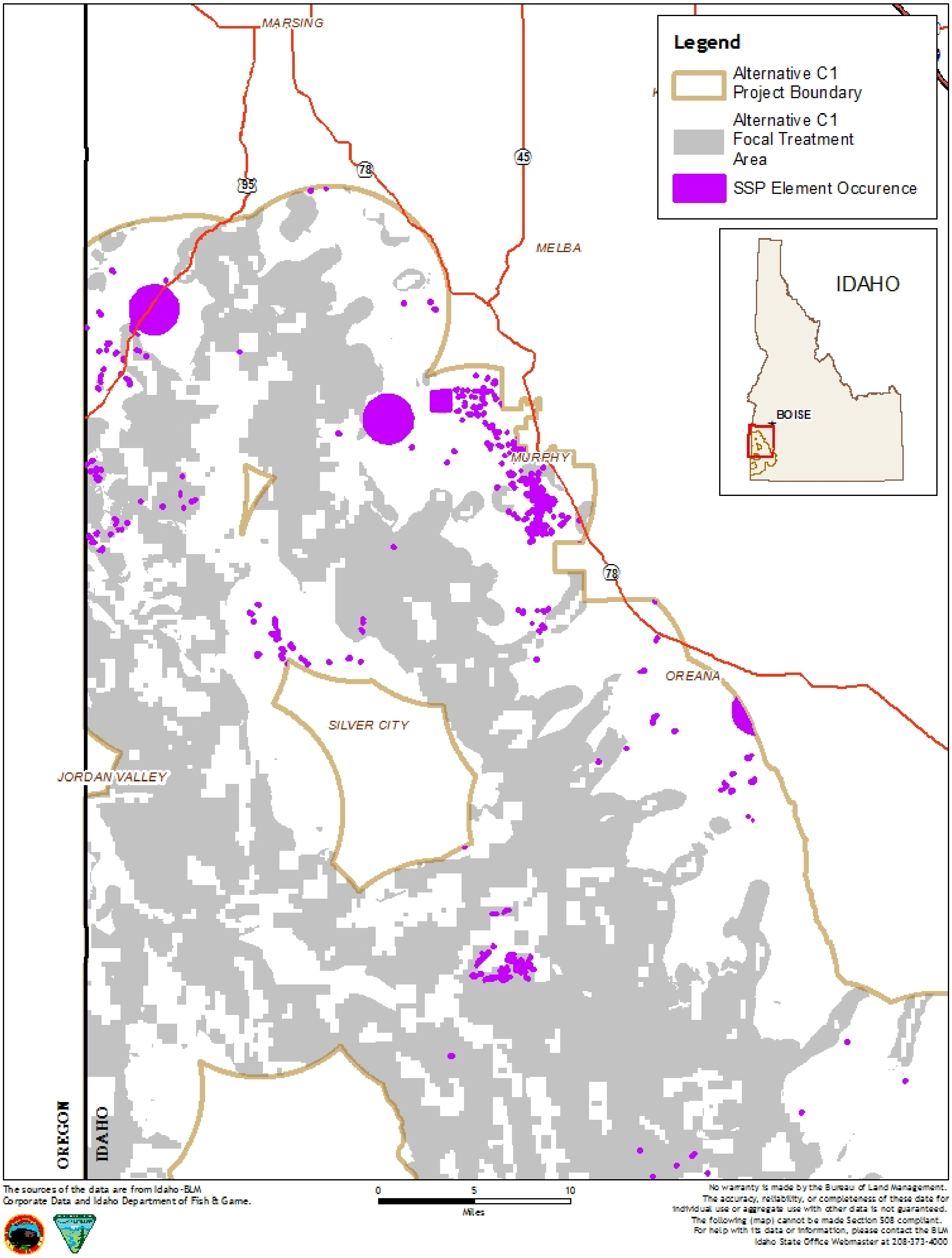
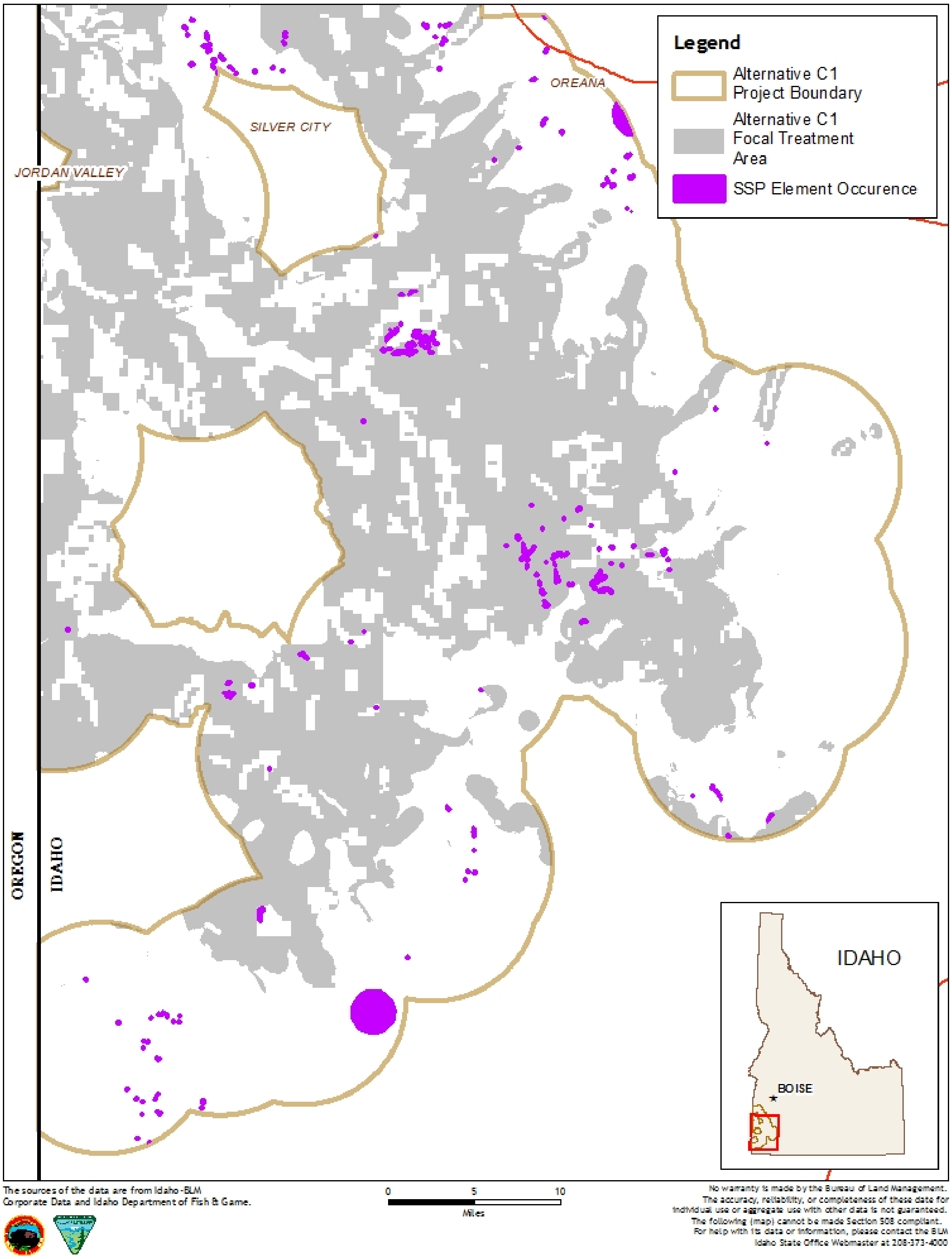
7. Resilience/Resistance In Alternative C1 Focal Treatment Area



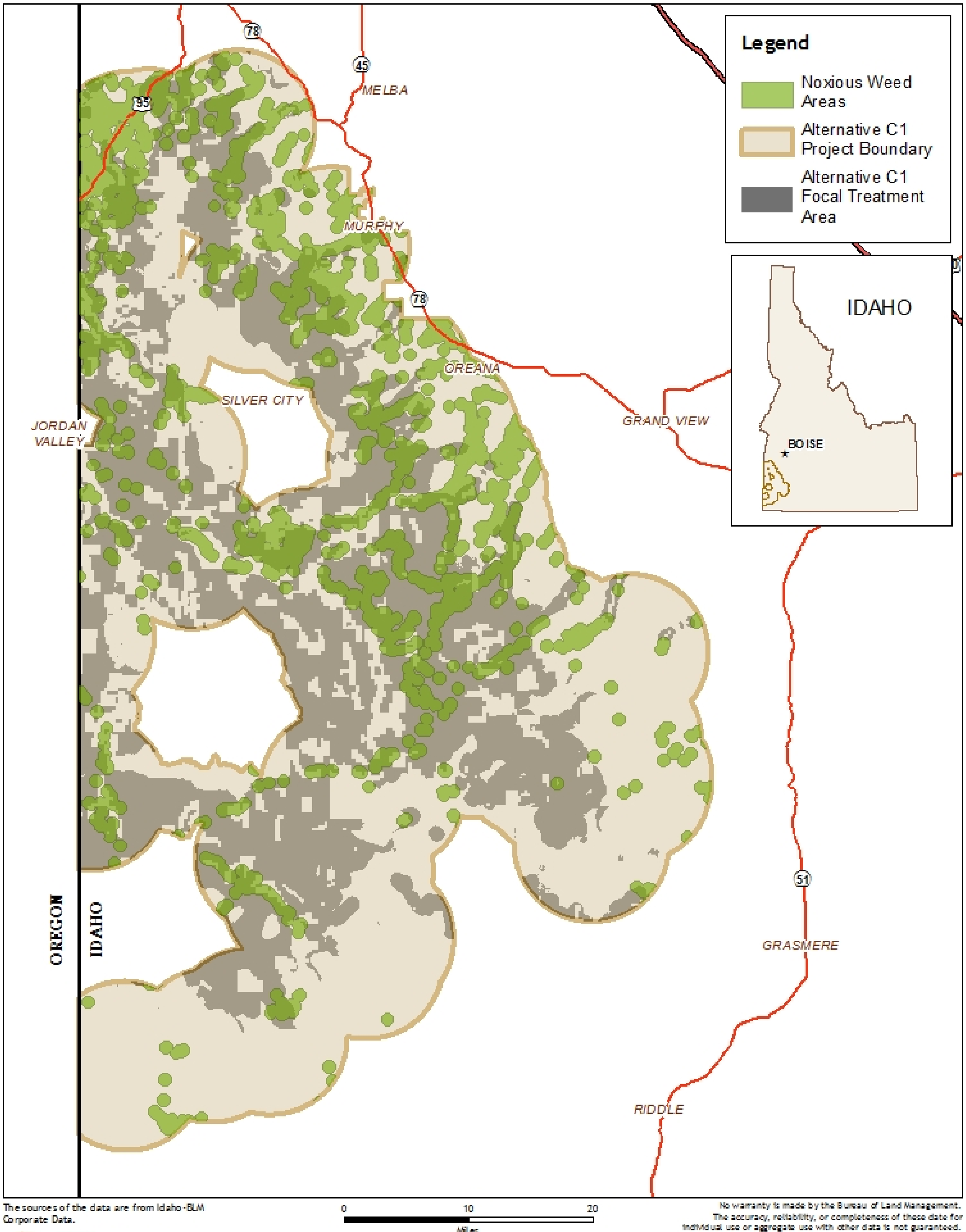
8. Special Status Plant Element Occurrences



9. Special Status Plant Element Occurrences



10. Noxious Weeds Within The Project Area



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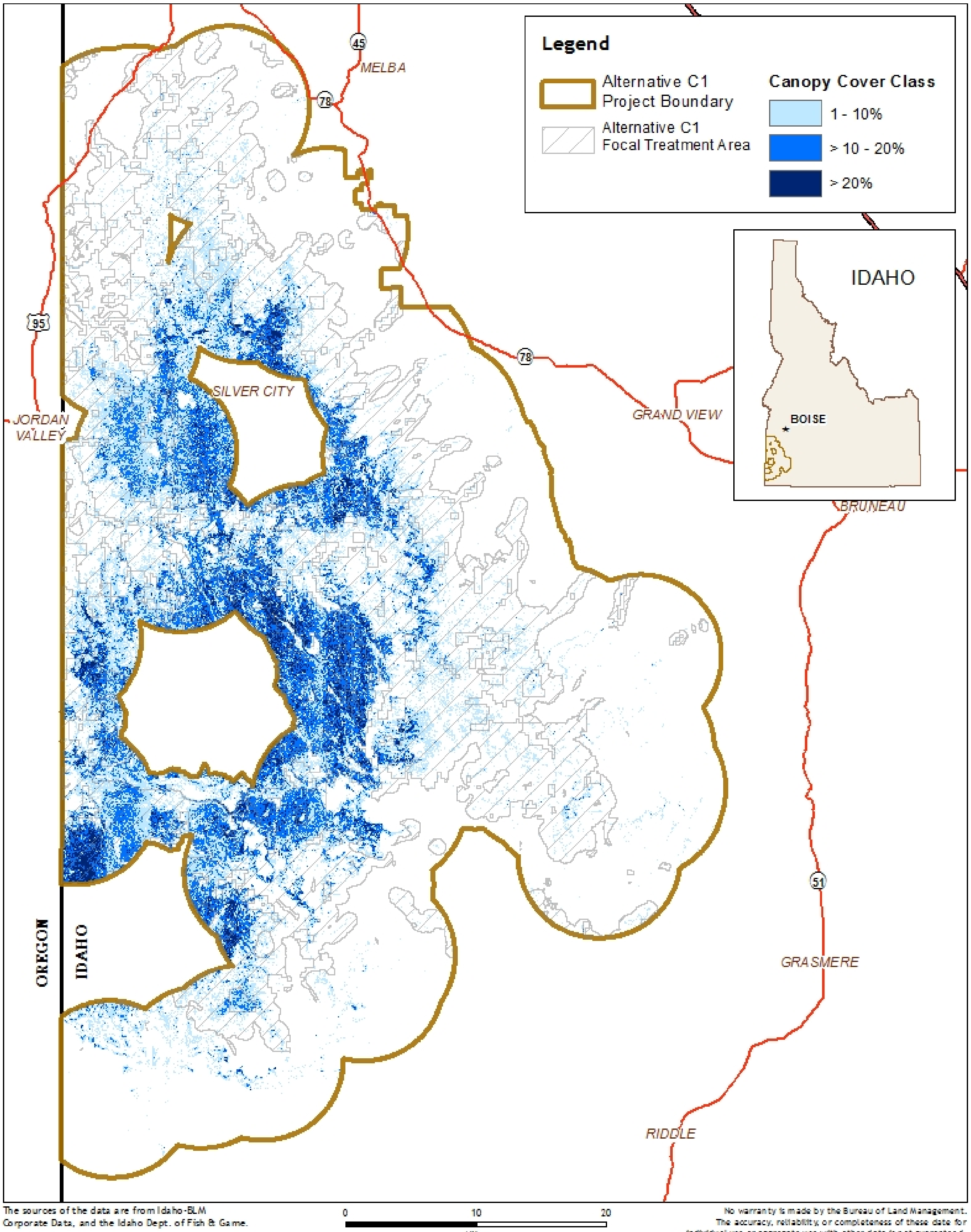
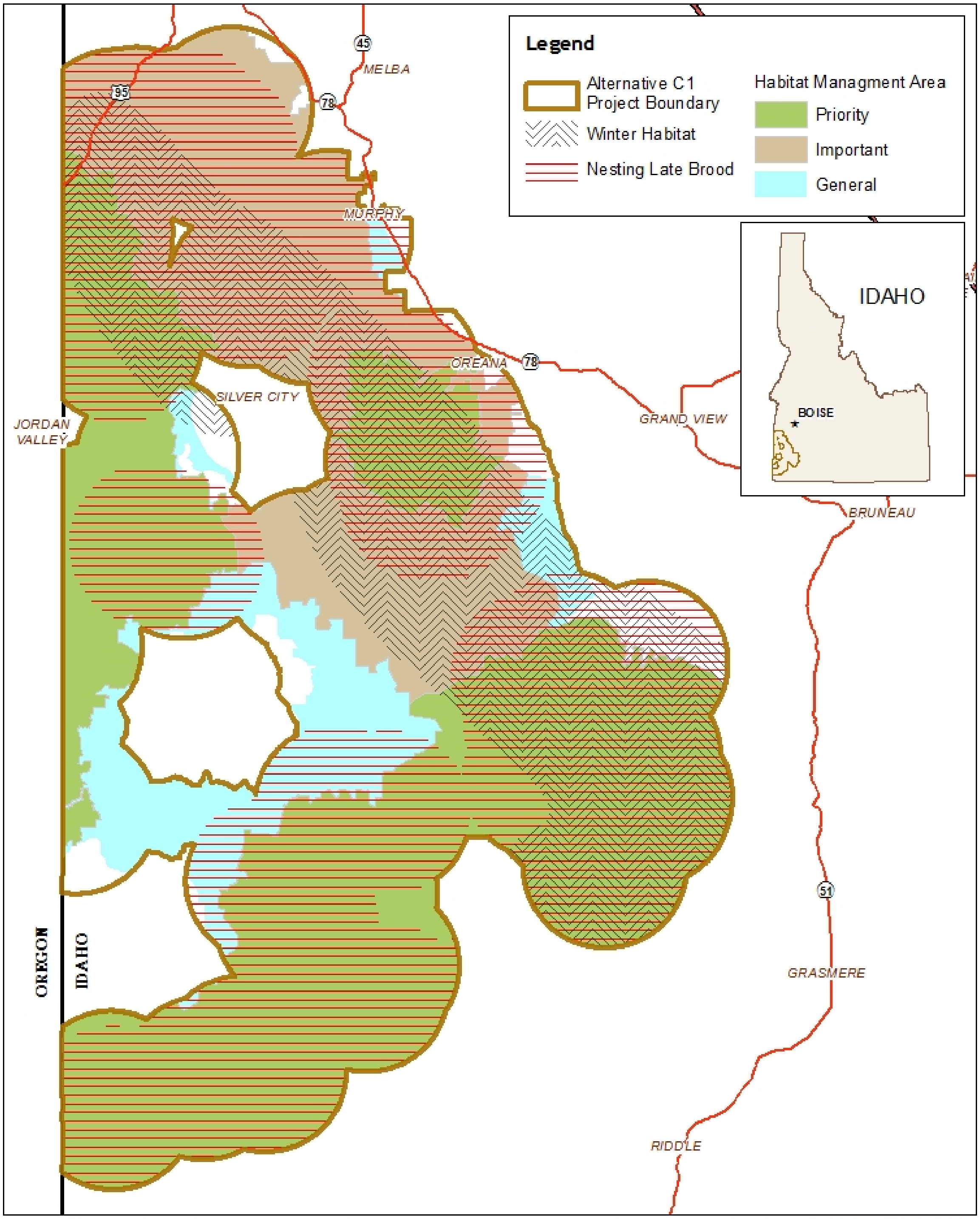
11. Canopy Cover Classification



The sources of the data are from Idaho-BLM Corporate Data, and the Idaho Dept. of Fish & Game.

No warranty is made by the Bureau of Land Management. The accuracy, reliability, or completeness of these date for individual use or aggregate use with other data is not guaranteed. The following (map) cannot be made Section 508 compliant. For help with its data or information, please contact the BLM Idaho State Office Webmaster at 208-373-4000

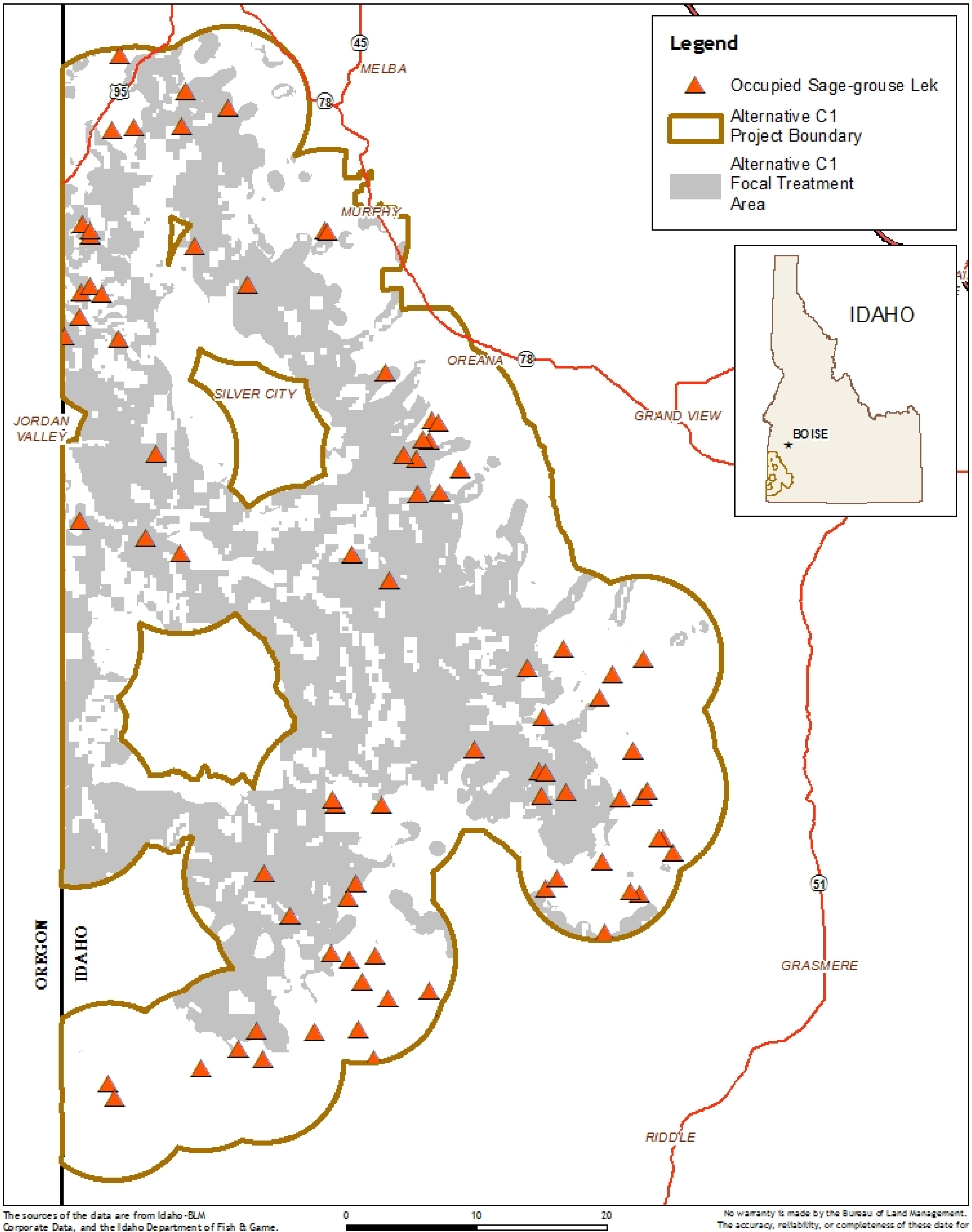
12. Greater Sage-grouse Habitat



The sources of the data are from Idaho-BLM Corporate Data.

No warranty is made by the Bureau of Land Management. The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed. The following (map) cannot be made Section 508 compliant. For help with its data or information, please contact the BLM Idaho State Office Webmaster at 208-373-4000

13. Sage-grouse Leks in Alternative C1 Project Area



The sources of the data are from Idaho-BLM Corporate Data, and the Idaho Department of Fish & Game.

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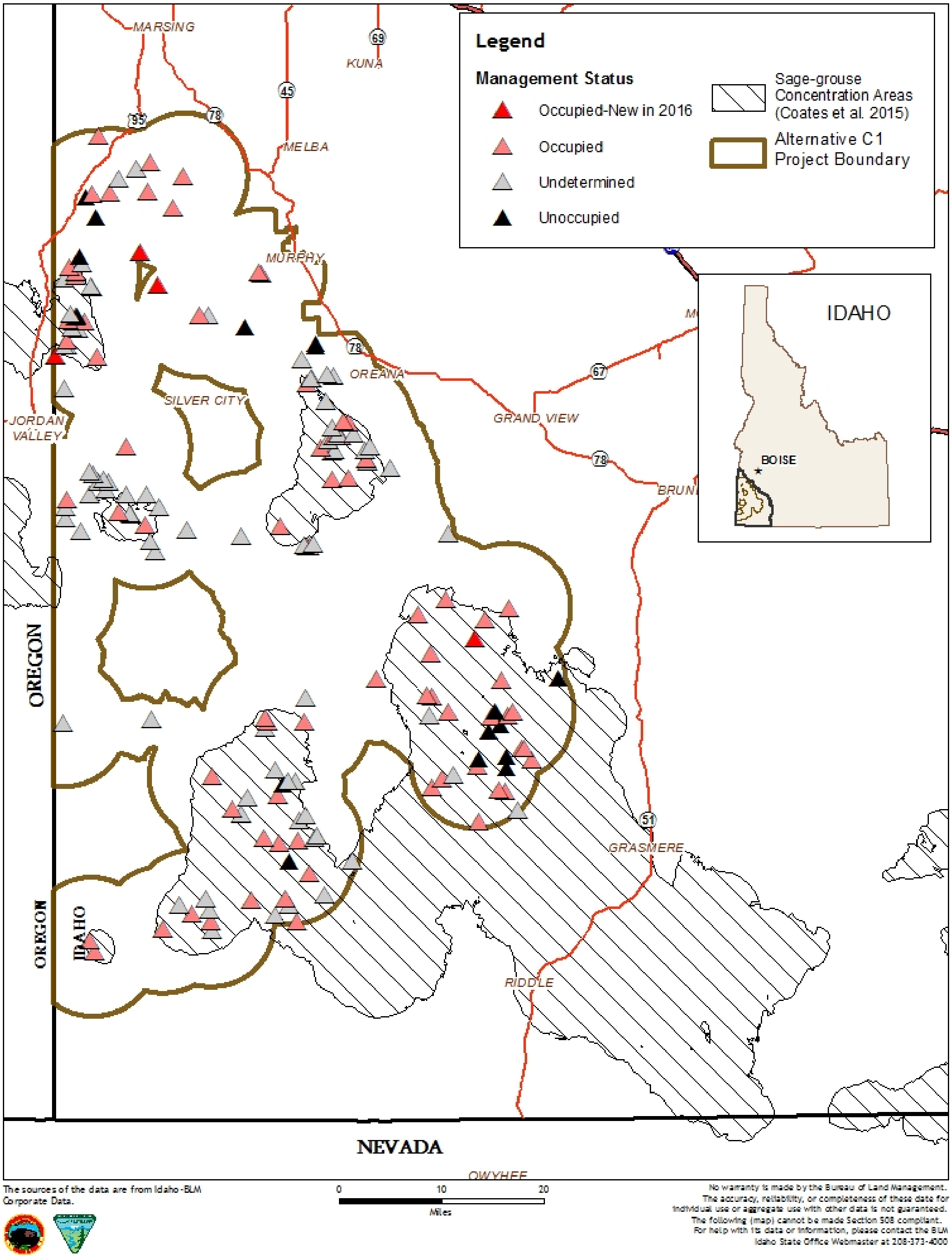
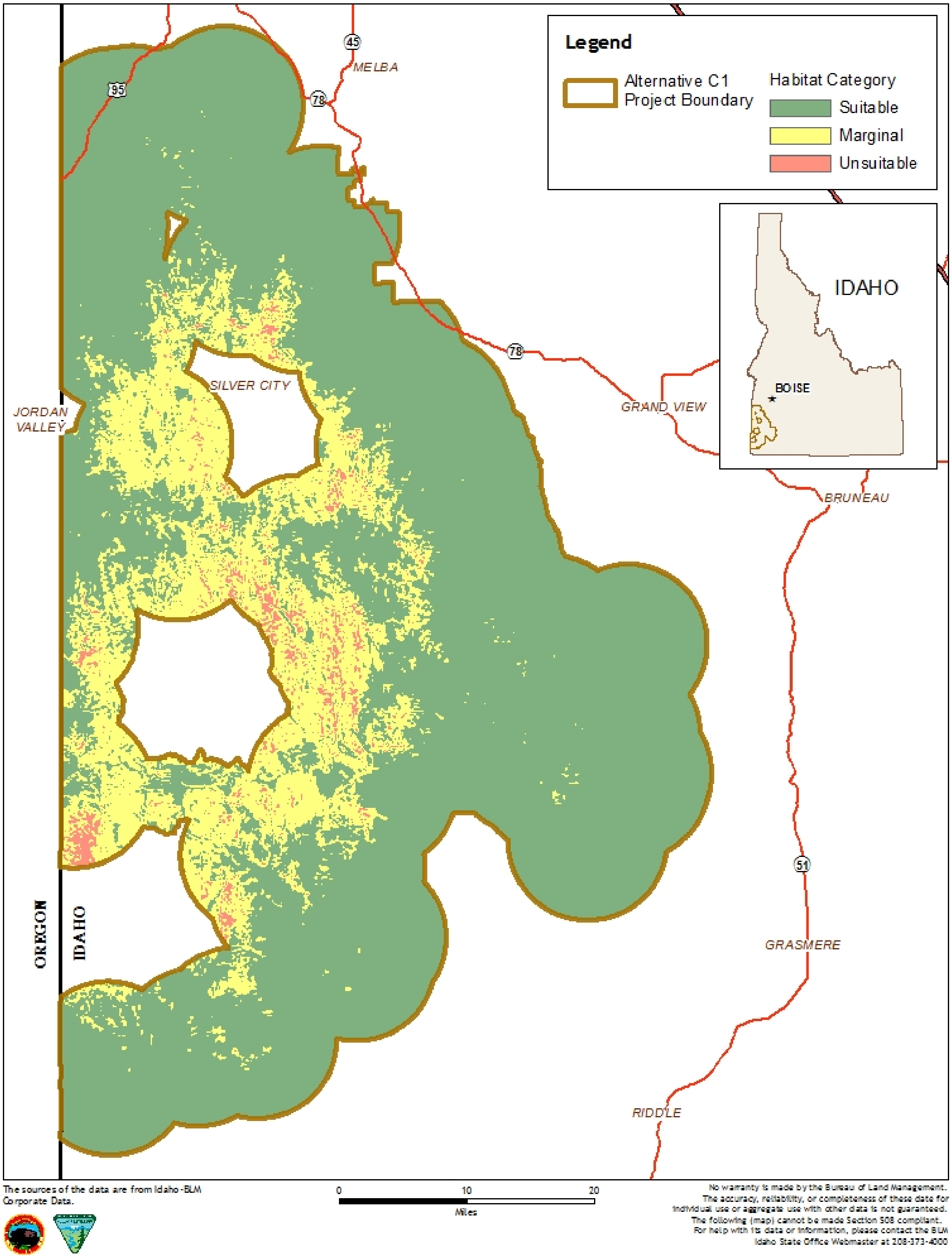
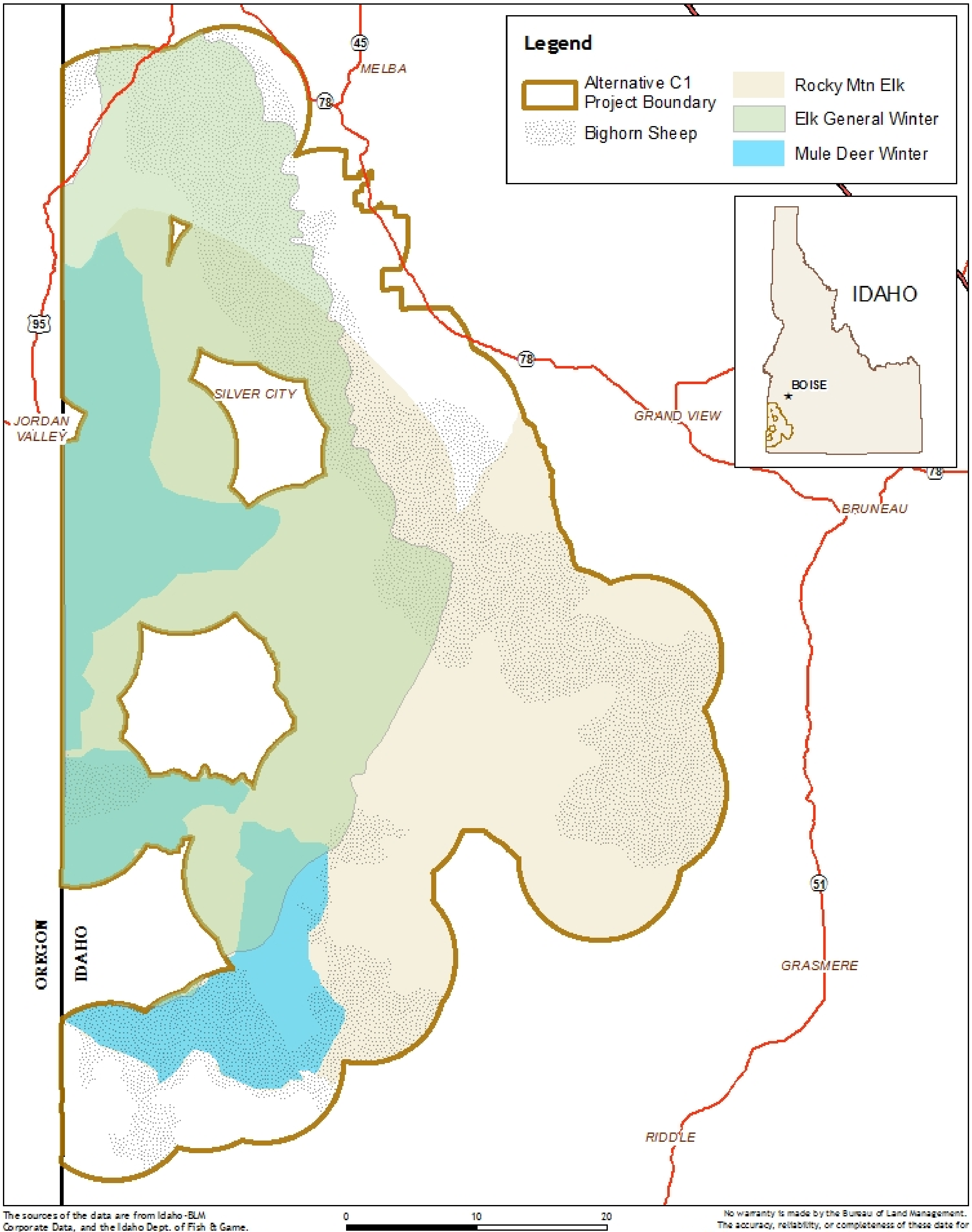
14. Status of Sage-grouse Leks (2016) in Alt. C1 Project Area



15. Pronghorn Antelope Habitat



16. Big Game Habitat (Elk, Mule Deer & Bighorn Sheep)



The sources of the data are from Idaho-BLM Corporate Data, and the Idaho Dept. of Fish & Game.

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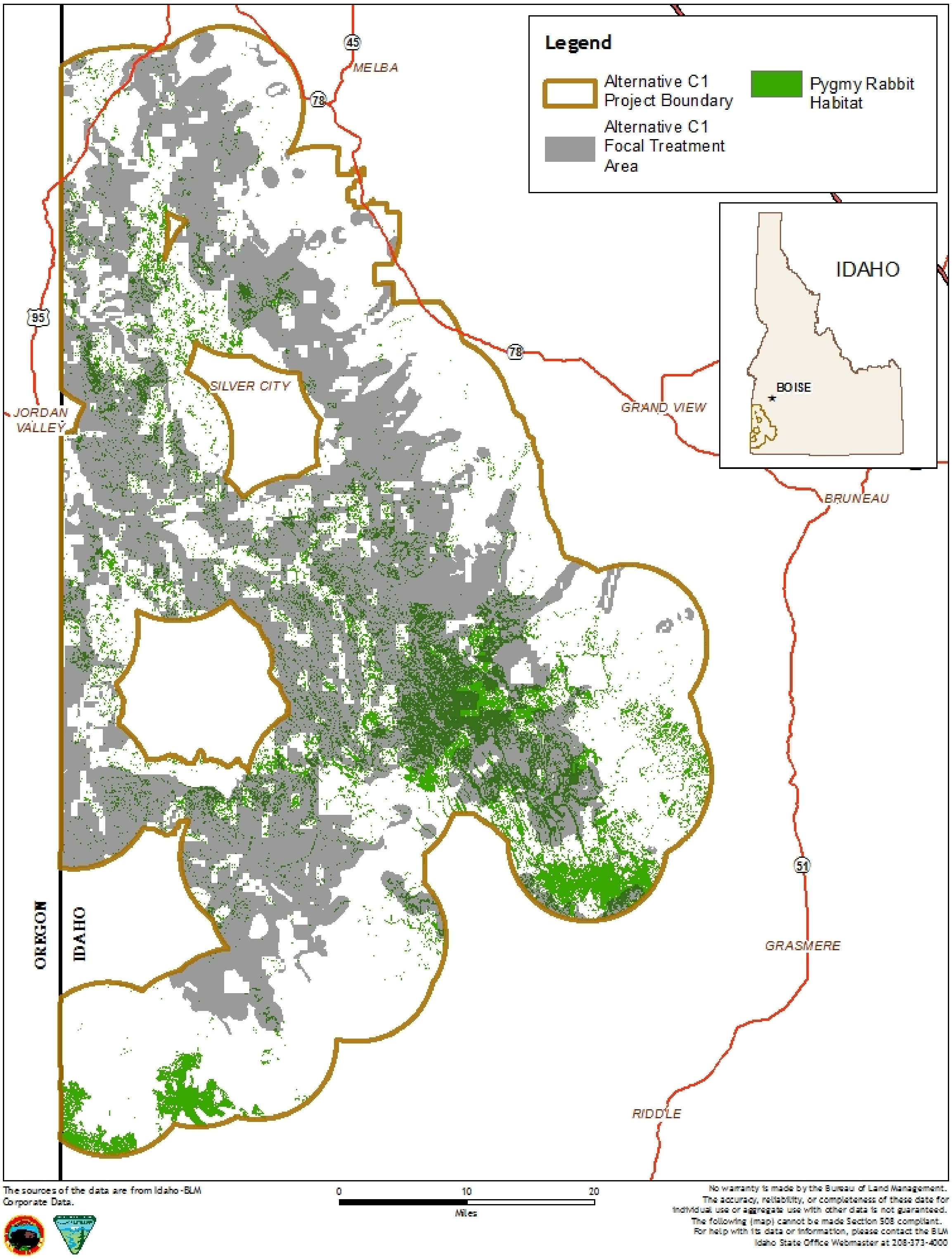
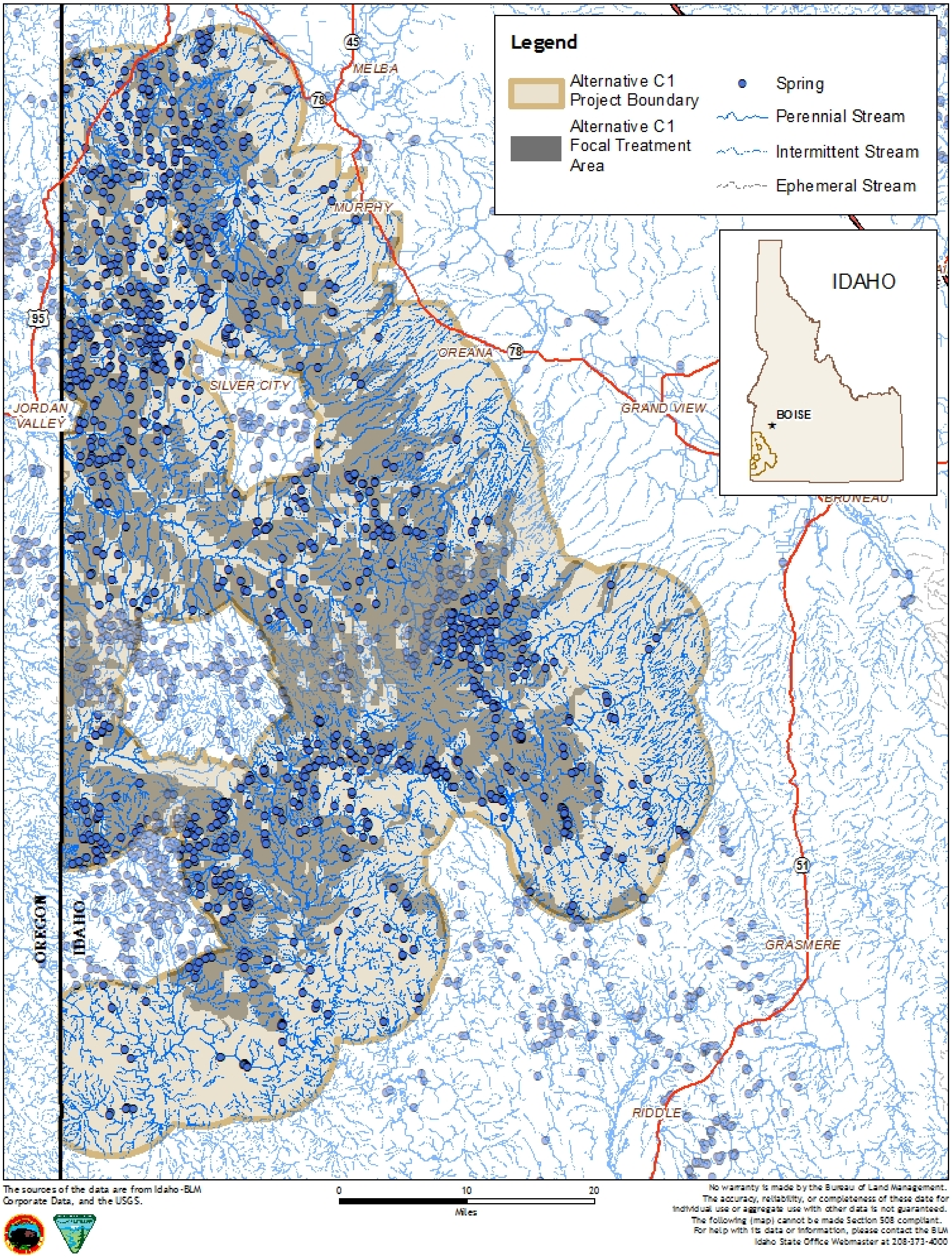
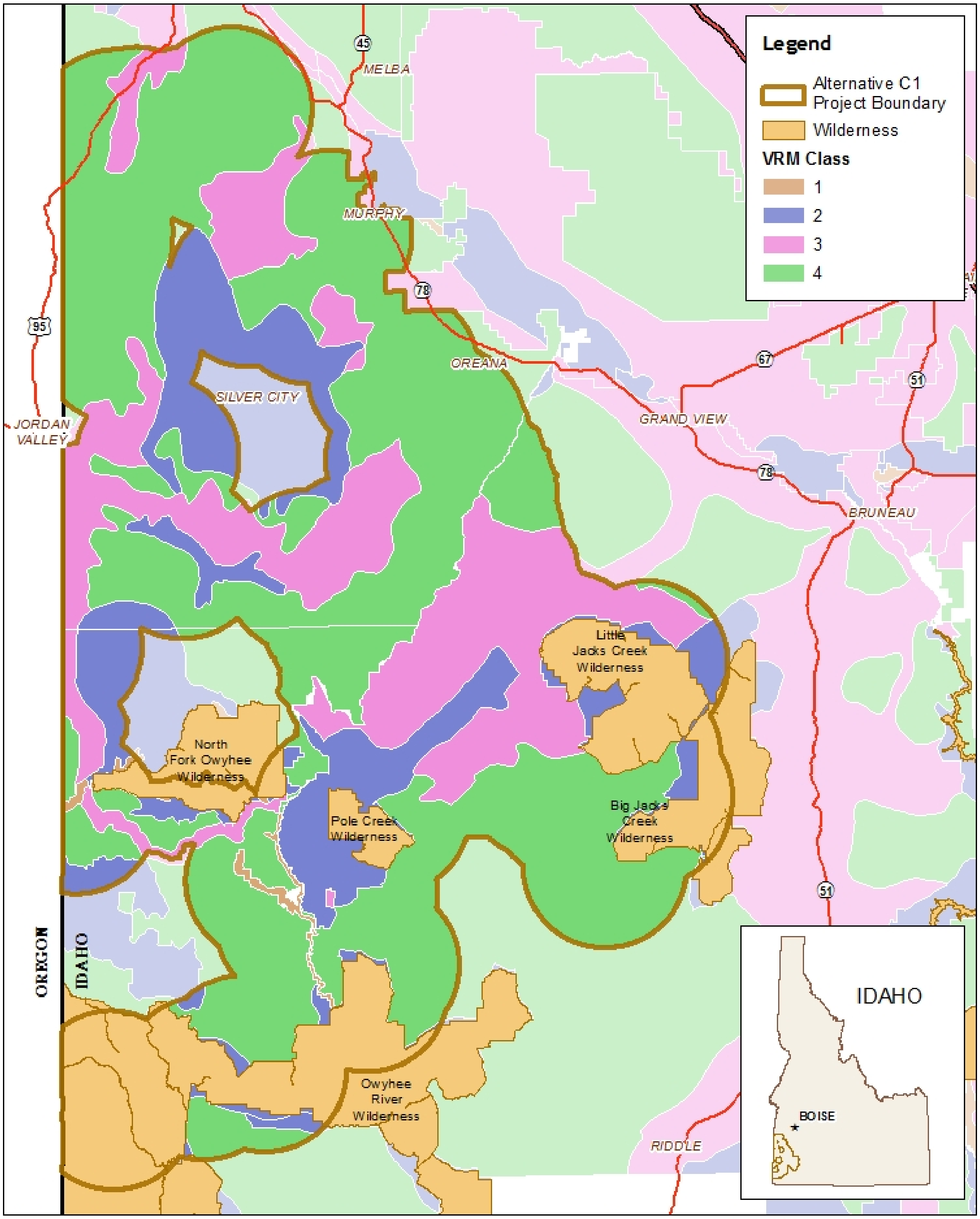
17. Pygmy Rabbit Habitat



18. Streams and Springs in Alternative C1 Project Area



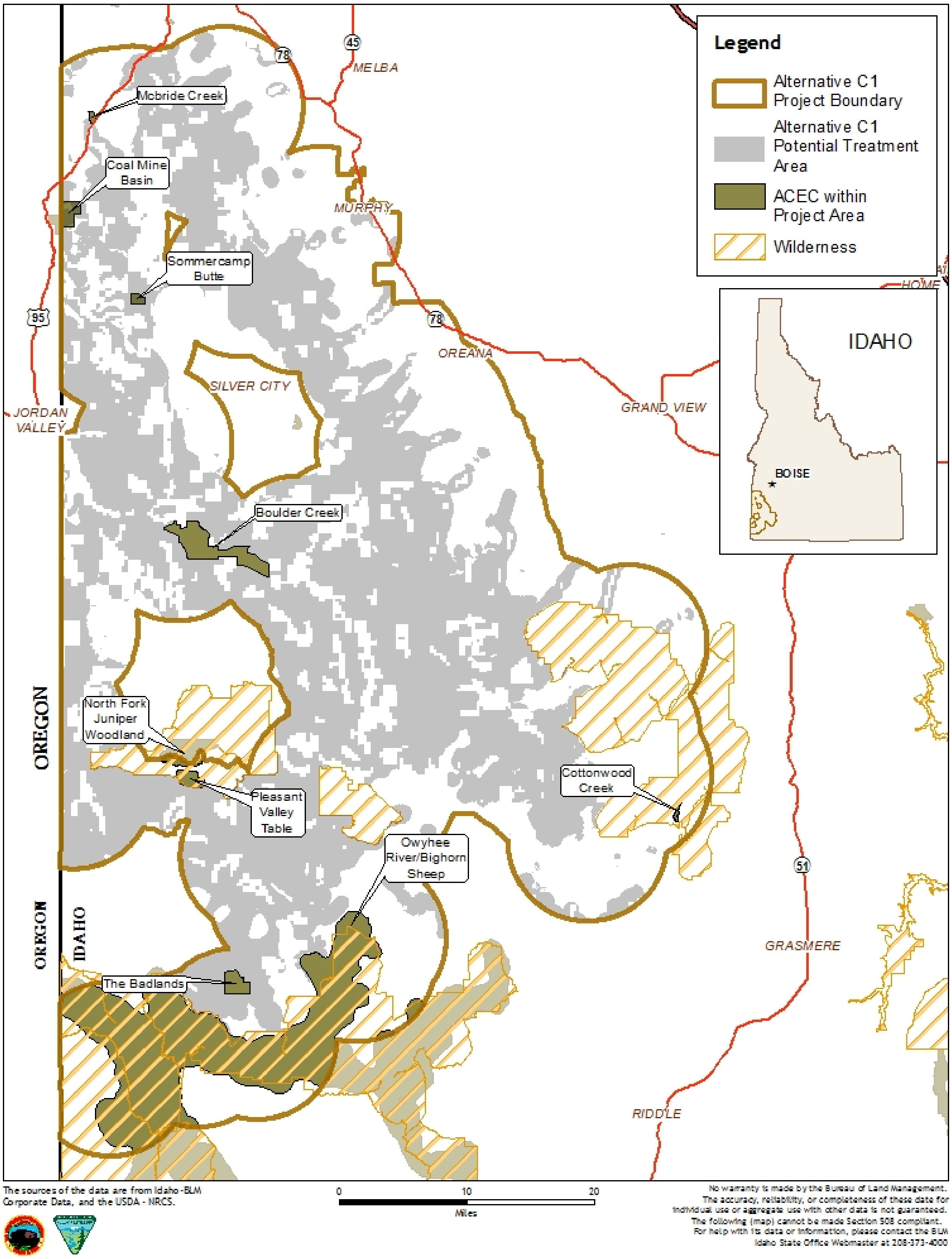
19. Wilderness and Visual Resource Management Areas



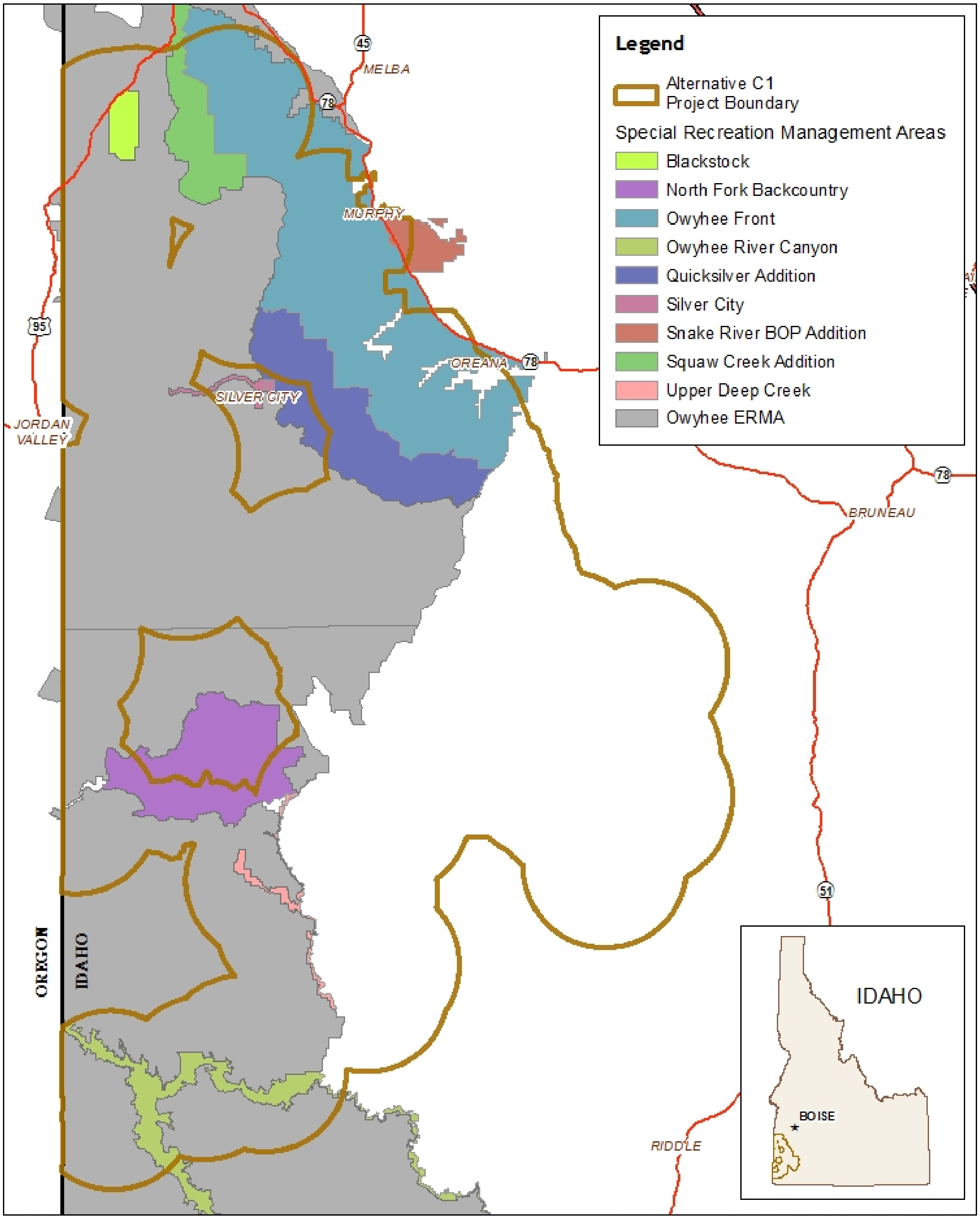
The sources of the data are from Idaho-BLM Corporate Data.

No warranty is made by the Bureau of Land Management. The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed. The following (map) cannot be made Section 508 compliant. For help with its data or information, please contact the BLM Idaho State Office Webmaster at 208-373-4000

20. Areas of Critical Environmental Concern



21. Special Recreation Management Areas



The sources of the data are from Idaho-BLM Corporate Data.

No warranty is made by the Bureau of Land Management. The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed. The following (map) cannot be made Section 508 compliant. For help with its data or information, please contact the BLM Idaho State Office Webmaster at 208-373-4000

7.0 Appendices

7.1 Appendix A – GRSG ARMPA Conformance Review

As part of Idaho's Greater sage-grouse (GRSG) Approved Resource Management Plan amendment (ARMPA) implementation, BLM actions must be reviewed by BLM Idaho's Core Sage-grouse Team (Implementation Team) for compliance with the 2015 ARMPA. During review, the Implementation Team may suggest Management Decisions (MD) or Resource Design Features (RDF) not previously identified by project planners for incorporation into or consideration for the project. Project planners may either incorporate the recommended MD and RDF if deemed applicable to the project, or provide rationale as to why suggested MD or RFD is/are not applicable to the project. The MD and RDF identified for the BOSH Project, as well as rationale for MDs deemed unrelated to the BOSH Project, are presented in the tables below.

ARMPA MD identified for the BOSH Project:

MD Number and Program Area	Description of the Management Decisions Authorizing the BOSH Project	Where the MD is Addressed or Why it is Not Applicable (N/A)
MD SSS 5	Prioritize activities and mitigation to conserve, enhance and restore GRSG habitats (i.e., fire suppression activities, fuels management activities, vegetation treatments, invasive species treatments etc.) first by Conservation Area, if appropriate (Conservation Area under adaptive management or at risk of meeting an adaptive management soft or hard trigger), followed by PHMA, then IHMA, then GHMA within the Conservation Areas. Local priority areas within these areas will be further refined as a result of completing the GRSG Wildfire and Invasive Species Habitat Assessments as described in **Appendix H** of the HAF (Stiver et al. 2015). This can include projects outside GRSG habitat when those projects will provide a	Pgs. 13, 21, 54
MD SSS 7	GRSG habitat within the project area will be assessed during project-level NEPA analysis within the management area designations (PHMA, IHMA, GHMA). Project proposals and their effects will be evaluated based on the habitat and values affected.	Chapters 2 and 3 (all pgs.)
MD SSS 33	Conduct implementation and project activities, including construction and short-term anthropogenic disturbances consistent with seasonal habitat restrictions described in Appendix C.	Pgs. 19-20
MD SSS 38	Monitor the effectiveness of projects (e.g., fuel breaks. fuels treatments) until objectives have been met or until it is determined that objectives cannot be met, according to the monitoring schedule identified for project implementation.	Pgs. 13-15 and Appendix A (pg. 146)
MD SSS 39	Monitor invasive vegetation post vegetation management treatment.	Appendix A (pg. 146)
MD VEG 1	Implement habitat rehabilitation or restoration projects in areas that have potential to improve GRSG habitat using a full array of treatment activities as appropriate, including chemical, mechanical and seeding treatments.	Pgs. 12-13

MD Number and Program Area	Description of the Management Decisions Authorizing the BOSH Project	Where the MD is Addressed or Why it is Not Applicable (N/A)
MD VEG 2	Implement vegetation rehabilitation or manipulation projects to enhance sagebrush cover or to promote diverse and healthy grass and forb understory to achieve the greatest improvement in GRSG habitat based on FIAT Assessments, HAF assessments, other vegetative assessment data and local, site specific factors that indicate sagebrush canopy cover or herbaceous conditions do not meet habitat management objectives (i.e., is minimal or exceeds optimal characteristics). This may necessitate the use of prescribed fire as a site preparation technique to remove annual grass residual growth prior to the use of herbicides in the restoration of certain lower elevation sites (e.g., Wyoming big sagebrush) but such efforts will be carefully planned and coordinated to minimize impacts on GRSG seasonal habitats.	Pgs. 12-13 and Appendix A (pgs. 146-147)
MD VEG 4	Implement management changes in restoration and rehabilitation areas, as necessary, to maintain suitable GRSG habitat, improve unsuitable GRSG habitat and to ensure long-term persistence of improved GRSG habitat (Eiswerth and Shonkwiler 2006). Management changes can be considered during livestock grazing permit renewals, travel management planning, and renewal or reauthorization of ROWs.	Current management doesn't threaten treatment success.
MD VEG 8	Remove conifers encroaching into sagebrush habitats, in a manner that considers tribal cultural values. Prioritize treatments closest to occupied GRSG habitats and near occupied leks, and where juniper encroachment is phase I or phase II. Use of site-specific analysis and tools like the FIAT report (Chambers et. al., 2014) will help refine the location for specific areas to be treated.	Pgs. 8-9
MD VEG 9	Incorporate results of the FIAT assessments in to projects and activities addressing invasive species as appropriate.	Pg. 3
MD VEG 10	Implement noxious weed and invasive species control using integrated vegetation management actions per national guidance and local weed management plans for Cooperative Weed Management Areas in cooperation with State and Federal agencies, affected counties, and adjoining private lands owners.	Pg. 20
MD FIRE 19	Apply appropriate seasonal restrictions for implementing vegetation and fuels management treatments according to the type of seasonal habitats present. Allow no treatments in known winter range unless the treatments are designed to strategically reduce wildfire risk around and/or in the winter range and will protect, maintain, increase, or enhance winter range habitat quality. Ensure chemical applications are utilized where they will assist in success of fuels treatments. Strategically place treatments on a landscape scale to	Pgs. 19-20
MD FIRE 22	Fuel treatments will be designed through an interdisciplinary process to expand, enhance, maintain, and protect GRSG habitat which considers a full range of cost effective fuel reduction techniques, including: chemical, biological (including grazing and targeted grazing), mechanical and prescribed fire treatments.	Pgs. 10, 20
MD FIRE 26	Protect vegetation restoration and rehabilitation efforts/projects from subsequent fire events.	The project area is already identified as a high priority for fire suppression.

ARMPA RDF identified for the BOSH Project:

RDF Number	Description of the Required Design Features Associated with the BOSH Project	Where the RDF is Addressed or Why it is Not Applicable (N/A)
RDF 1	Solicit and consider expertise and ideas from local landowners, working groups, and other federal, state, county, and private organizations during development of projects.	Pgs. 10, 20
RDF 2	No repeated or sustained behavioral disturbance (e.g., visual, noise over 10 dbA at lek, etc.) to lekking birds from 6:00 pm to 9:00 am within 2 miles (3.2 km) of leks during the lekking season.	Pg. 19
RDF 3	Avoid mechanized anthropogenic disturbance, in nesting habitat during the nesting season when implementing: 1) fuels/vegetation/habitat restoration management projects, 2) infrastructure construction or maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events.	Pg. 19
RDF 4	Avoid mechanized anthropogenic disturbance during the winter, in wintering areas when implementing: 1) fuels/vegetation/habitat restoration management projects, 2) infrastructure construction or maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events.	Pg. 19
RDF 20	Where applicable, design fuels treatment objectives to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat.	Pg. 15
RDF 22	Use burning prescriptions which minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion).	Pg. 15
RDF 26	Power-wash all vehicles and equipment involved in fuels management activities, prior to entering the area, to minimize the introduction of undesirable and/or invasive plant species.	Pg. 20
RDF 30	Remove standing and encroaching trees within at least 110 yards of occupied sage-grouse leks and other habitats (e.g., nesting, wintering and brood rearing) to reduce the availability of perch sites for avian predators, as resources permit.	Pgs. 12-13, 21
RDF 40	Utilize available plant species based on their adaptation to the site when developing seed mixes.	Pg. 19
RDF 45	Assess existing on-site vegetation to ascertain if enough desirable perennial vegetation exists to consider techniques to increase on-site seed production to facilitate an increase in density of desired species.	The project is designed to meet this RDF; pgs. 12-13
RDF 46	Use site preparation techniques that retain existing desirable vegetation.	The project is designed to meet this RDF; pgs. 12-13
RDF 48	Utilize post-treatment control of annual grass and other invasive species.	Pg. 20
RDF 49	Utilize new tools and use of new science and research as it becomes available.	Pg. 16
RDF 50	Give higher priority to vegetation rehabilitation or manipulation projects that include: • Sites where environmental variables contribute to improved chances for project success (Meinke et al. 2009). • Projects that address conifer encroachment into important GRSG habitats. In general the priority for treatment is 1) Phase 1 (≤10% conifer cover), 2) Phase 2 (10-30%), and 3) Phase 3 (greater than30%).	The project is designed to meet this RDF; pgs. 12-13

7.2 Appendix B – Treatment Unit Planning Form

Unit Planning Form

Unit Number: ________

This form documents that all necessary clearance and collaboration with other agencies has been completed for the unit.

Archaeology Clearance: ________________________ Date Completed: _______________
Boise District Archaeologist

Botany Clearance: ____________________________ Date Completed: _______________
Boise District Botanist

Wildlife Clearance: ____________________________ Date Completed: _______________
Boise District Wildlife Biologist

Unit planning meeting with collaborating agencies Date Completed: _______________

Agencies Present: ____

Unit planning site visit with collaborating agencies Date Completed: _______________

Agencies present: ____

The signatures below acknowledge that the BLM has completed all necessary collaboration and clearances for this unit.

____ Date Signed: ___________________
Bruneau Field Office Manager

____ Date Signed: ___________________
Owyhee Field Office Manager

7.3 Appendix C – Monitoring Plan

Implementation Monitoring

Treatment implementation monitoring is the inspection of operations during treatment implementation to document adherence to applicable design features such as; juniper mortality, clean stumps, low laying material etc. Implementation monitoring documents resource conditions during implementation, equipment issues, and/or resolutions, and any necessary adjustments to the prescribed designs. Information derived through implementation monitoring would be used to improve future juniper project design.

Effectiveness Monitoring

Treatment effectiveness monitoring includes the initial and subsequent collection of qualitative and quantitative information at randomly established monitoring sites. Effectiveness monitoring would be conducted at regularly scheduled intervals to inform whether treatments are becoming adequately established, whether re-treatments are necessary, and whether maintenance is required to ensure effectiveness.

Effectiveness Monitoring consists of the following:
1. Pre-implementation inventory to establish a baseline of existing vegetation conditions in and adjacent to the proposed treatment and would be used to inform which treatment method would be most appropriate for a given site.
2. Post-implementation monitoring to inform management of resource conditions and would be used to spatially and temporally compare treatments, if subsequent treatments or maintenance is needed, and to determine progress towards meeting long-term goals and objectives.

Treatment Mapping
The actual treatment footprint would be mapped immediately post-implementation using global positioning system (GPS) technology and incorporated into Idaho BLM Vegetation Treatment Geodatabase (VTG). The resulting Geographic Information System (GIS) shape-file would define the physical extent of the treatments. Plot locations would be marked with witness posts (see Monitoring Methodology below) and would be recorded using Trimble or equivalent GPS technology therefore providing reference points to verify GPS accuracy.

Landscape photo plots
Monitoring would be conducted at a landscape level using photo plots that encompass as much of treatment area as possible. Landscape photos will show early juniper encroachment into sagebrush stands prior to treatment and post treatment, as well as overall vegetation response (i.e., changes in native perennial and/or invasive vegetation) in uplands and riparian areas.

Monitoring plans would be designed and included for each treatment unit (see Annual Treatment Unit Development, section 2.2.3 above). For example, if a treatment unit includes juniper removal from a spring site, the monitoring plan may include pre- and post-vegetation monitoring and response of greenline. Inventories and surveys for noxious weeds, special status and other plants and wildlife, and cultural sites would also be ongoing.

Sage-grouse Habitat Monitoring/HAF

Objective: attain habitat indicators (sagebrush height and cover, grass/forb height and cover, and proper functioning condition [PFC] of riparian areas) in the suitable range for breeding, upland summer/late brood rearing, and riparian summer/late brood rearing habitat within 10 years following treatment. Indicators for habitat suitability objectives are presented in the tables below. Ecological site descriptions (USDA NRCS 2015) will be used to determine site potential for various habitat types and to stratify monitoring locations.

Breeding Habitat – Nesting/Early Brood Rearing

Breeding Habitat Indicators (means)[1]				
Ecotype	**Sagebrush Cover (%)**	**Sagebrush Height (cm)**	**Grass/Forb Cover (%)**	**Grass/Forb Height (cm)**
Mesic Sites	15-25	40-80	≥15/≥10	≥18/≥18
Arid Sites	15-25	30-80	≥10/≥5	≥18/≥18

[1] Per Form S-3: Sage-grouse Site Scale Habitat Suitability Worksheet – Breeding Habitat in the HAF Technical Reference 6710-1.

Upland Summer/Late Brood Rearing Habitat

Upland Summer/Late Brood Rearing Habitat Indicators (mean)[1]		
Sagebrush Cover (%)	**Sagebrush Height (cm)**	**Grass/Forb Cover (%)**
10-25	40-80	≥15

[1] Per Form S-4: Sage-grouse Site Scale Habitat Suitability Worksheet – Upland Summer/Late Brood Rearing Habitat in the HAF Technical Reference 6710-1.

Riparian Summer/Late Brood Rearing Habitat

Riparian Summer/Late Brood Rearing Habitat Indicator (mean)[1]
Riparian Stability
Majority of riparian areas treated are in PFC

[1] Per Form S-5: Sage-grouse Site Scale Habitat Suitability Worksheet – Riparian Summer/Late Brood Rearing Habitat in the HAF Technical Reference 6710-1.

Indicator Measurements and Methods

Habitat indicators would be measured prior to treatment and in years 1, 5, and 10 following treatment to determine vegetation response and whether objectives are being met (or trending toward meeting objectives).

Habitat indicators (vegetation characteristics) to be measured include:

- Mean shrub height and percent canopy cover
- Mean height and percent canopy cover of perennial grasses and forbs

Other vegetation/site characteristics to be measured include:

- Presence/cover of cheatgrass and other non-native, invasive annual species
- Percent ground cover

Wildlife/Special Status Animals

Sage-grouse

Project implementation would take approximately 10 to 15 years, providing the opportunity for long-term monitoring and scientific studies. To document sage-grouse response to juniper treatments, the BLM is working with the University of Idaho and other agencies on a radio-telemetry project. Monitoring of sage-grouse would focus on, but would not be limited to, the following:

- Response to and use of treated areas
- Migration or other movement patterns
- Seasonal habitat availability and use
- Lek attendance
- Use of spring sites for brood rearing
- Changes in nesting areas
- Survival

Special Status Animals

Special status wildlife species and potential impacts resulting from the proposed action would be monitored. Several efforts would inform management on treatment effects on wildlife, including several research projects in the Great Basin, songbird monitoring sites, and additional wildlife surveys on annual treatment units, particularly for raptors. In 2016, several pertinent research projects were initiated focusing on habitat manipulation in the Great Basin (Great Basin Landscape Conservation Cooperative 2016). The study "*Multi-scale assessment of wildlife response after juniper removal in a sagebrush steppe landscape"* is specific to BOSH and is being conducted by the University of Idaho in cooperation with U.S. Geological Survey. This is a Before-After-Control-Impact (BACI) study that focuses on how juniper removal affects the distribution and abundance of juniper and sagebrush-obligate species, including migratory songbirds, small mammals, and raptors. Other projects in the Great Basin include U.S. Forest Service Rocky Mountain Research Station *"Quantifying the combined effects of climate, fire, and treatments on the connectivity and fragmentation of wildlife populations across the Great Basin*", University of Nevada-Reno *"Measuring the regional impacts of pinyon and juniper removal on insect, bat, and reptile communities*", and Joint Fire Science research "*Relations among cheatgrass-driven fire, climate, and sensitive-status birds across the Great Basin"*. The latter focuses on occupancy modeling of several SSW species in the project area and two other sites in the Great Basin as well as potential climate change effects.

Songbird monitoring sites would be part of the regional Integrated Monitoring of Bird Conservation Regions (IMBCR[13]). IMBCR is a program developed by the Bird Conservancy of the Rockies to allow for comparison of density and occupancy estimates among several geographic areas in the Intermountain West and at different spatial scales (Hanni et al. 2015). Songbird surveys would focus on pre-treatment and three years post-treatment of the first 1-2 annual treatment units. Details on songbird monitoring would be determined based on availability of funding.

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[13] For more information, see http://birdconservancy.org/what-we-do/science/monitoring/imbcr-program.

The University of Idaho research and IMBCR monitoring will also provide some information on raptors. In addition, areas targeted for treatment would be surveyed for raptor nests following standard protocols as described in Smith and Slater (2009). Surveys would be conducted at least several months prior to treatment as well as the following year. Other long-term bird monitoring projects include golden eagle monitoring in the Snake River Plain and Owyhee Front just north of the project boundary, as well as three Breeding Bird Survey routes within the project area.

Before treatment, the BLM would also survey for pygmy rabbits in areas with little juniper cover, but otherwise with appropriate habitat characteristics, e.g. soil types, slope, etc. These surveys would focus on areas close to occupied habitat and continue 2-3 years post-treatment in order to determine whether pygmy rabbits colonized treated areas.

Noxious Weed Inventory and Monitoring

Noxious weeds encountered within or adjacent to the project area would be photographed and a GPS position would be recorded in Universal Transverse Mercator coordinate system (UTMs). This information would be provided to the District Weeds Specialist for entry into the National Invasive Species Information Management System (NISIMS) per reporting requirements and to ensure an appropriate weed treatment occurs.

Hydrology/Riparian Monitoring

Types of monitoring would include, but not be limited to, the following:

- Riparian vegetation response – Photo documentation would be employed to capture vegetation response to treatment within riparian areas (e.g., expansion of greenline). Photo documentation sites would be established prior to treatment and re-visited in years 1, 5, and 10 following treatment to determine vegetation response (Hall, 2001).

7.4 Appendix D – Response to Public Comments (from Draft EIS)

The table below documents the review of comments for the BOSH Draft EIS. The BLM received 56 emails and letters and numbered them based on the date they were received. The table is organized by letter number and comments gleaned from letters have been numbered. Additionally, the BLM received over 2,000 nearly identical form letters labelled "F". All correspondence was taken into account in the preparation of the Final EIS, but only comments that required a response/explanation are included in the table. Issues and alternatives identified through this review have been incorporated in the Final EIS. All comment letters and emails are part of the project record.

Sender	Letter/Email Number
Jean Public	1
Jim Myron	2
WildLands Defense (Fite)	6
The Wilderness Society	11
Karen Steenhof	14
Oregon Wild (Heiken)	15
WildLands Defense (Fite)	17
Cynthia Patterson	19
Andrew Follett	20
Brandt Mannchen	21
Peter Alpert	22
Rose Chilcoat	23
Clarence Sanders	24
Louise Wallace	25
Jodie Young	27
Karen Steenhof	28
Vince Murray	29
WildLands Defense (Fite)	30
Jeff Lonn	31
WildLands Defense (Hayes)	32
Mule Deer Foundation (Belinda)	33
North American Grouse Partnership (Belinda)	34
National Park Service (Hurd)	35

Sender	Letter/Email Number
Great Old Broads for Wilderness (Lowe)	36
Idaho Department of Fish and Game (Yarbrough)	37
Idaho State Department of Agriculture (Jacobson)	38
Wilderness Watch (Macfarlane)	40
George Wuerther	42
Western Watersheds Project & Boise Broadband (Cole)	43
Governor’s Office of Species Conservation (Miller)	44
Idaho Department of Lands (Laney)	45
WildLands Defense (Fite)	46
WildLands Defense (Fite)	47
James Woods	48
Richard Stanley	51
US Department of Agriculture (Elke)	53
US Fish and Wildlife Service (Hughes)	55
Shoshone-Paiute Tribes (Howard)	56
Form letters	F

Response ID#	Theme	General Comment	Letter/ Email #	Response	EIS Location
001	ACEC	Full and fair evaluation of ACECs to protect important remaining native plant and animal communities must be considered.	17, 43	Impacts to ACEC and their values are addressed in the Final EIS.	Section 3.9 Areas of Critical Environmental Concern
002	Additional Alternatives - Grazing	No grazing; No grazing in sensitive areas; Reduced grazing (change utilization levels in all systems); Drastically alter grazing management (alter timing, remove fences, include active and passive restoration of wetlands and uplands not meeting land health standards);	17, 43, F	These proposals were considered and addressed in section 2.7 of the final EIS. Changes to grazing management are outside the scope of this project.	Section 2.7 Alternatives Considered but Not Analyzed in Detail
003	Additional Alternatives - ACEC	Create ACEC(s) to protect important sage-grouse habitats from grazing and other disturbances.	17	This proposal was considered and discussed in section 2.7 of the final EIS. ACEC designation is outside the scope of this project.	Section 2.7 Alternatives Considered but Not Analyzed in Detail
004	Additional Alternatives - Treatments Restricted to Sage-grouse Habitat Outside Grazing Allotments	Restore sage-grouse habitat outside of grazing allotments using selective hand cutting of younger juniper trees in the vicinity of sage grouse leks and important use areas.	43	This proposal was considered and discussed in section 2.7 of the final EIS. Restricting juniper treatments to lands outside of grazing allotments in the project area would not meet the purpose of and need for large-scale juniper removal to, in turn, improve habitat for sage-grouse. Approximately 50,000 acres of the project area are not allocated for livestock grazing. This would reduce the treated area by 676,000 acres.	Section 2.7 Alternatives Considered but Not Analyzed in Detail

005	Carbon/Climate Change	The DEIS fails to provide a quantified analysis of the significant long-term transfer of carbon from the ecosystem to the atmosphere. BLM must manage its lands and be part of the solution (keeping carbon in ecosystems) instead of part of the problem (causing GHG emissions by killing native trees across 100s of thousands of acres and contributing to climate change).	15	BLM acknowledges that the project will release carbon into the atmosphere. However, the project's potential impacts on climate change, global carbon sink, and contribution to GHG emissions are difficult to quantify due to uncertainty and variability of estimates (see Section 3.14 carbon Sequestration). The project proposes to cut and leave 86% of junipers in focal treatment areas. Over the 10-15 year life of the project, a total of 14% of focal treatment areas or 6% of the entire project area may be cut and burned. Within the project area and around to the project area, juniper will continue to grow and expand.	Section 3.14 Carbon Sequestration
006	Carbon/Climate Change	The NEPA analysis must avoid minimizing this project's contribution to carbon emissions and global warming by saying the effects of this project would be negligible on a global scale. All emissions are part of the problem, and all land management decisions must be part of the solution.	15, 40, 43	A section on Greenhouse Gases and Climate Change has been added to the FEIS.	Section 3.14 Carbon Sequestration
007	Carbon/Climate Change	Carbon emissions due to juniper removal and burning would reduce above-ground accumulation of carbon.	15	BLM acknowledges that the project will result in some carbon emissions, particularly from jackpot and pile burning. However, most of the juniper would be felled and left on site, thereby leaving carbon available for uptake by other organisms and/or soils. Estimates on carbon stock and emissions associated with jackpot or pile burning have been added in the FEIS (Section 3.14 Greenhouse Gases and Climate Change).	Section 3.14 Carbon Sequestration

008	Carbon/Climate Change	How will the release of stored carbon due to juniper removal be mitigated?	2	BLM does not intend to mitigate any juniper removal. BLM has provided a range of estimates for carbon sequestration and carbon release in the FEIS. Impacts on global carbon sequestration are difficult to quantify due to model assumptions and a range of estimates for input variables. In most of the treated areas, junipers would be cut and left and some juniper would be returned to the ecosystem. BLM's actions will increase ecosystem resilience to climate change, wildfire and invasion of exotic annual grasses. Therefore, BLM's actions may reduce the long-term transfer of carbon from sagebrush-ecosystems to the atmosphere and assist with adapting to climate change.	Section 3.14 Carbon Sequestration
009	Carbon/climate change	Intact native habitats, such as sagebrush and juniper, are important to buffer against impacts of climate change.	17	BLM acknowledges that this statement may be true. The goal of the project is to maintain sagebrush steppe habitat in the project area. Several hundred thousand acres of juniper would remain in the project after treatment, maintaining a diversity of habitat types across the landscape. Without juniper treatment, juniper encroachment and development would continue, reducing sagebrush habitats further. Without vegetation management, the risk of wildfire and the invasion of cheatgrass in dense juniper woodlands would increase, thus negating potential benefits of juniper growth against climate change.	Sections 1.0 Introduction and 2.3-2.7 Description of the Alternatives, and Section 3.14 Carbon Sequestration

010	Causes of Juniper Expansion	Need to address grazing's role in habitat degradation as a causal factor for juniper expansion, and therefore, grazing management should be changed to restore sagebrush steppe habitat.	15, 17, 19, 30, 36, 40, 43, 47, F	Historic grazing practices are identified in the EIS as a cause of habitat loss/degradation of sagebrush steppe habitat. The BLM recognizes that there are numerous threats to sage-grouse habitat and causes for juniper expansion; however, the focus of this EIS is juniper removal to improve sage-grouse habitat. The BLM considered numerous proposals to change livestock grazing management in section 2.7 of the EIS. Changes to grazing management are outside the scope of this project.	Section 1.0 Introduction; Section 2.7 Alternatives Considered but Not Analyzed in Detail
011	Causes of Juniper Expansion	Need to address the role of fire suppression/lack of natural fire as a causal factor for juniper expansion. Analyze fire reintroduction for juniper control.	15, 31, 36, 40, 42, 43, F	The role of fire suppression/lack of fire in the expansion of juniper is addressed in the final EIS in section 1.0. Changes to fire suppression practices are outside the scope of this project. Introduction of fire would result in the loss of sagebrush and sage-grouse habitat. The proposed action maintains sagebrush on the landscape and therefore maintains sage-grouse habitat.	Section 1.0 Introduction
012	Causes of Juniper Expansion	Expansion of juniper is normal/natural fluctuation in density and range; expansion is a response to changes in climate.	15, 40, 43	The potential role of climate change in the expansion (and contraction) of juniper range is addressed in the final EIS in section 3.14.	Section 3.14 Carbon Sequestration

013	Cultural Resources	Include protections (flagging, monitoring, etc.) to OR Trail, specifically high potential historic sites and a high potential route segment identified in the 1999 comprehensive plan/EIS (Utter Massacre site, Givens Hot Springs, and Sinker Creek segment) to avoid direct and indirect impacts.	35	None of these high potential sites and segments are in the project area: the Utter Massacre site is about 6 miles east of the project boundary; the Givens Hot Springs site is on private property about 0.4 miles northeast of the project boundary (east of Highway 78) and 1.5 miles from the nearest proposed treatment; and the Sinker Creek segment is approximately 4 miles east of the project boundary. Roughly 2 miles of Oregon Trail crosses the project area on private land. Design features, mitigation measures, and best management practices (Section 106 compliance and 2014 State Protocol Agreement) are in place to mitigate direct and indirect impacts to national historic trail (NHT) resources. If future treatments are proposed adjacent to the trail where the setting may be affected, measures will be taken to avoid or mitigate those impacts per design features and best management practices.	Section 1.6 Relationship to Statutes, Regulations, and Other Requirements; Section 2.2.5 Design Features; and Section 3.11 Cultural Resources
014	Cultural Resources	Cultural Resources not sufficiently protected.	17, 30, 43, 46	Extensive design features, mitigation measures, and best management practices (Section 106 and 2014 State Protocol Agreement compliance) are in place to mitigate direct and indirect impacts to cultural resources; potential impacts are analyzed and disclosed in the EIS.	Section 1.6 Relationship to Statutes, Regulations, and Other Requirements; Section 2.2.5 Design Features; and Section 3.11 Cultural Resources
015	Cumulative Impacts	Need to include existing IDL activities in cumulative impacts analysis (i.e., mineral leases and reclamation plans)	45	Addressed in the final EIS.	Section 3.0 and individual resources cumulative impacts
016	Cumulative Impacts	Need to address other BLM actions	6, 17, 29, 30, 36, 40, 43, 47, 51	The cumulative effects section addresses numerous BLM actions including mining, recreation, livestock grazing, travel management, fuel breaks, juniper treatments, and exurban development.	Section 3.0 Affected Environment and Environmental Consequences

017	Cumulative Impacts	Analyze effects of existing fences on avian mortality (sage-grouse and other species), increasing predator travel corridors, nest predator perches, brood parasite perches, habitat fragmentation, and sage-grouse in general. Calculate the current fence density and map in relation to sensitive species habitats.	17, 43	Fencing is an aspect of livestock grazing and has been addressed under Cumulative Effects - Grazing in the final EIS since the project will not change amount of fencing in project area.	Section 3.5.3.2 Cumulative Impacts - Wildlife -- Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions
018	Cumulative Impacts	Effect of livestock grazing on riparian areas, sagebrush ecosystem, and sage-grouse; the DEIS must consider the serious cumulative impacts on sage-grouse. It fails to consider in adequate detail the many other harms sage-grouse are subject to in the project area, such as annual grasses and fire cycles, and how this project will impact them. It fails to consider how the increased intensity of livestock grazing facilitated by this project will adversely affect sage-grouse in the project area. It fails to consider other impacts such as proposed and implemented fuelbreaks, as well as power lines and other infrastructure.	6, 17, 30, 43, 46, 47	Cumulative effects of livestock grazing are analyzed for riparian areas, sagebrush communities, and sage-grouse in the EIS in the Cumulative Impacts sections for these resources in the EIS. The EIS discloses the impacts of numerous past, present, and future actions including livestock grazing (and associated infrastructure - fencing), fuel breaks projects, wildfire, mining, exurban development, other juniper treatments, and recreation.	Section 3.0 Affected Environment and Environmental Consequences (Cumulative Impacts)
019	Cumulative Impacts	Relationship to Fuel Breaks	6, 17, 30, 46, 47	The BOSH project is not related to fuel breaks in any way. Potential cumulative impacts from ongoing or planned fuel breaks projects are disclosed for each resource in the final EIS.	Section 3.0 Affected Environment and Environmental Consequences - Cumulative Impacts; Cumulative Impacts - all resources (3.X.3)

020	Cumulative Impacts	Relationship to TMP	6, 17, 30, 46, 47	There is no relationship between the BOSH project and travel management planning, other than they are both BLM actions. The BOSH project is to improve and maintain sage-grouse habitat, whereas, the TMP work is to manage roads and travel on BLM managed lands.	Section 3.0 Affected Environment and Environmental Consequences
021	Fire	Let natural fires burn/reintroduce fire; consider/analyze changes to fire suppression.	15, 19, 21, 24, 51	The authorization for using natural fire as a management tool is outside the scope of this EIS. Fire is one of the major threats to sage-grouse habitat and causes of habitat fragmentation identified in the COT Report (USDI USFWS 2013). Allowing natural fires to burn or reintroducing fire does not meet the purpose of and need for the project to maintain and improve sage-grouse habitat on a landscape scale.*However, the 1999 Owyhee Field Office Resource Management Plan (OFO RMP) does allow prescribed fire to be used as a management tool to improve rangeland health and manage natural fire in certain areas (Juniper Mtn. area) when conditions are appropriate.*	Section 1.0 Introduction
022	Fire	Fire history and frequency data are wrong; fire return and disturbance models (fire regimes, historic fire return intervals, etc. not accurate.	17, 30, 47	BLM did not use fire history or frequency data as rationale for the project. The references to fire frequency in the EIS are used to identify that as fire occurs on the landscape, fire frequency would increase as annual grasses invade burned areas. Regardless of the cause, the negative impacts of juniper expansion are well documented, and BLM's focus is to alleviate those impacts and maintain viable habitat for sage-grouse and other wildlife species. Therefore, fire regimes and fire return intervals are referenced in the EIS, but these models are not used as a basis for analyzing where to treat early phase juniper.	Section 3.0 Affected Environment and Environmental Consequences (Cumulative Impacts) and Section 3.12 Fire Behavior

023	Fire	How would the project affect fire frequency and severity?	2	Effects of the treatments/project on fire behavior (frequency and severity) are discussed in the EIS.	Section 3.12.2 Fire Behavior--Environmental Consequences
024	Grazing	Stop livestock grazing; remove livestock; reduce livestock grazing (AUMs)	6, 15, 17, 19, 20, 22, 27, 29, 30, 31, 32, 43, 46, 47, 48, 51, F	These proposals were considered and addressed in section 2.1 of the final EIS. Changes to grazing management are outside the scope of this project.	Section 2.7 Alternatives Considered but Not Analyzed in Detail
025	Grazing	Increase allotted AUMs as more forage becomes available following juniper removal.	45	Changes to livestock operations are outside the scope of this project.	Section 2.7 Alternatives Considered but Not Analyzed in Detail
026	Grazing	Sec 3.6.3.3 pg. 67 - clarify "improperly managed" grazing causes degradation, not grazing in general	38	Section 3.6.3.3 includes livestock grazing in the list of the past, present and reasonably foreseeable future actions/activities that affect wildlife; not necessarily causing degradation. The general cumulative effects of livestock grazing on wildlife are described in section 3.6.3.2.	Section 3.5.3.2 Current Conditions and Past, Present, and Reasonably Foreseeable Future Actions; Section 3.5.3.3 Alternative A - Cumulative Impacts (Wildlife)
027	Grazing	All aspects of grazing need to be addressed regarding role of grazing in ecological conditions, etc.	6, 17, 30, 46, 47, 48	Livestock grazing has been addressed for each resource in the cumulative effects analyses. The BLM considered numerous proposals to change livestock grazing management in section 2.1 of the EIS. Changes to grazing management are outside the scope of this project.	Cumulative Impacts Sections (3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3, 3.10.3, 3.12.3); Section2.1 Alternatives Considered but Not Analyzed in Detail

028	Grazing	Complete a study to determine the impacts of grazing to sage-grouse	15, 17, 30, 43, 47	A Before-After-Control-Impact study was initiated in 2014 by University of Idaho and U.S. Geological Survey to evaluate the response of greater-sage grouse to grazing. For more information, see *https://idahogrousegrazing.wordpress.com/*.	Section 3.5.3.4 Current Conditions and Past, Present, and Reasonable Foreseeable Future Actions (Alternative A-Cumulative Impacts-Greater Sage-Grouse-Grazing)
029	Grazing	Cause of loss of Sage Grouse habitat	32, 36, 40, 43, 47	Historic grazing practices are identified in the EIS as one of the causes of habitat loss/degradation of sagebrush steppe habitat. The BLM recognizes that there are numerous threats to sage-grouse habitat and causes for juniper expansion; however, the focus of this EIS is juniper removal to improve sage-grouse habitat. The BLM considered numerous proposals to change livestock grazing management in section 2.1 of the EIS. Changes to grazing management are outside the scope of this project.	Section 1.0 Introduction; Section 1.1 Need for and Purpose of Action; and Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Greater Sage-Grouse
30	Weeds	Spread of noxious weeds not analyzed/addressed	2, 15, 17, 30, 32, 36, 38, 43, 47, 48	The potential spread of noxious and invasive weeds is analyzed in the EIS.	Section 2.2.4 Methods - subheadings Vehicle Use, Pile and Jackpot Burning, and Mastication and Shearing; Section Design Features 2.2.5 - subheadings Vegetation and Noxious Weeds and Invasive Plants; Section 3.1.2 (Soils) Environmental Consequences

031	Invasive/Noxious Weeds	BLM does not employ integrated weed management and ignores weed proliferation caused by livestock	6, 17	The BLM Boise District has a weed program that inventories, treats and monitors noxious weed infestations. This program also partners with Counties to form Cooperative Weed Management Areas to help control/stem noxious weed proliferation. In addition, the BLM has a bio-control program in place to treat noxious weeds across the state through biological means. These programs are integrated in an effort to control noxious weeds in the Boise District. The control of noxious weeds in the context of livestock grazing/livestock grazing management is outside the scope of this project.	Section 3.4 Noxious Weeds
032	Juniper	Concern about removal of old growth juniper	15, 17, 30, 47	Loss of old growth by contractor misidentification during treatments, or accidental take during burning is possible; however, design features and methods have been developed to minimize this potential.	Section 2.2.4 Methods; and Section 2.2.5 Design Features
033	Juniper	Consider marking old growth trees to prevent loss/cut during treatments	30	There are too many old growth trees within the project area to mark them all. The definition and description is provided to the contractors and they will apply those criteria as they treat juniper. This has proven to be very successful in past juniper treatment projects.	Not in the EIS
034	Juniper	In sagebrush communities, juniper removal should only involve hand cutting of trees < 10 ft high, and only where essential for sage-grouse	17	The focal treatment area has been identified by using sagebrush canopy cover, which means that all proposed treatment areas have sagebrush present. Using hand saws (e.g., pruning saws) would not be time effective or cost efficient. Only cutting trees <10 feet tall would not meet the purpose and need as there are several post-settlement trees that are over 10 feet tall. The project area was delineated based on the area used by 80% of nesting hens, in other words, essential habitat for sage-grouse.	Section 1.0 Introduction; Section 2.2.2 Focal Treatment Area Development; and Section 2.2.4 Methods

035	Juniper	Blanket deforestation could occur under this proposal without accountability	30	The project is a collaborative effort between several agencies and conservation groups. BLM has been and will continue to work closely with collaborators in project design including identification and layout of Annual Treatment Units. Additionally, there are thousands of acres of juniper that do not meet the criteria for treatment and would not be cut. Blanket deforestation is a gross overstatement of the purpose and need of the proposed project.	Section 1 Introduction; and Section 2.2.3 Annual Project Development
036	Juniper	Jackpot burning could result in escaped fire and weed infestation	30, 47	The timing for jackpot burning is designed to reduce the likelihood of adjacent vegetation be consumed by fire. Jackpot burning would occur when the ground is wet, snow covered, or frozen. The likelihood of jackpot fire leading to the loss of vegetation from an escaped fire is negligible.	Section 2.2.3 Methods
037	Juniper	The extent of mastication is unclear, but is necessary for impact analysis.	30	Mastication would only occur within 200 feet of roads. Alternative C1 proposes the greatest amount of mastication, which is 8,000 acres. This equates to 1% of the focal treatment area.	Section 2.3 Comparison of Action Alternatives
038	Juniper	Juniper is important to the ecosystem. Proposed treatments would result in a drastic loss of juniper and biodiversity.	6, 15	Juniper will remain across the landscape, within and outside of the project area. Proposed treatments would lead to a mosaic of sagebrush steppe and juniper habitat and focus on early encroaching juniper, not dense stands or old-growth juniper. Several wildlife species use a gradient of habitat types except for sagebrush-obligate bird species, such as sagebrush sparrow and sage-grouse (Miller et al. 2005, Reinkinsmeyer et al. 2007). Treatment of juniper would benefit sagebrush-obligate species and sagebrush ecosystems and not result in a loss of biodiversity.	Section 1 Introduction; Section 2.2.2 Focal Treatment Area Development; Section 2.2.3 Methods; and Section 3.5.1 Wildlife/Special Status Animals--Affected Environment

039	Juniper	Leave juniper on site	15	Juniper would be left on site on 86-87% of the area treated. Areas where juniper canopy cover is at or near 20% may have too much biomass to effectively be scattered across the landscape or in areas where BLM would like to mitigate fire risk. In these areas, juniper may be jackpot or pile burned (12-13% of the area treated).	Section 2.3 Comparison of Action Alternatives; Sections 2.4-2.6 2.5 Alternative Descriptions 3.X.2 Environmental Consequences – all resources
040	Juniper	Is the wood available?	10, F	Yes, the felled juniper would be available to the public based on the wood permitting process and the associated rules and regulations.	Not in the EIS
041	Juniper	Create options for expanding use of heavy equipment (60m is arbitrary)	33, 34, 45	The 200-foot area near roads was not developed arbitrarily. It was designed to protect the public and firefighters in the event of a wildfire near roads during the time when felled juniper needles would be dry and easily combustible and therefore pose a threat to human safety. The 200 foot zone was established to reduce that threat. Further, the cost of treating juniper using heavy equipment is very high.	See Section 2.2.4-- Methods
042	Juniper	If possible (with USFWS and IDFG), decrease timing restrictions for treatments	33, 34	The timing restrictions are to protect sage-grouse and other BLM sensitive species and migratory birds during critical periods of their life history, e.g. breeding, or winter. Restrictions are in accordance with statutes, regulations, and other requirements (see Section 1.6).	See Section 1.5 Conformance with Applicable Land Use Plans; Section 1.6 Relationship to Statutes, Regulations, and Other Requirements
043	Juniper	Juniper has likely waxed and waned over the scale of millennial climate cycles.	15	This is true. Over the past 5000 years, juniper woodlands have expanded and receded multiple times. However, the current rate of expansion is unprecedented (Rau et al. 2011). Further evidence stems from the fact that fewer than 10% of current woodlands are > 140 years old (Miller and Tausch 2001; Miller et al. 2008).	Section 3.14 Greenhouse Gases and Climate Change

044	Juniper	Juniper treatment not based on science	23, 30, 47	The project is founded on the latest scientific research, which indicates that juniper negatively impacts sage-grouse populations (Baruch-Mordo et al. 2013; Coates et al. 2017; Prochazka et al. 2017; and Severson et al. 2017c). Juniper treatments have been shown to improve habitat conditions for sage-grouse and increase populations (Sanford et al. 2017; Severson et al. 2017b; and Severson et al. 2017c).	Section 1 Introduction; Section 3.5.2.Environmental Consequences--Wildlife/Special Status Animals--Greater Sage-grouse
045	Juniper and Hydrology	How will removal of juniper effect hydrology	17, 30, 47	The effects of juniper removal to hydrology are discussed in the EIS.	See Section 3.6.2 Environmental Consequences
046	Juniper and Hydrology	No scientific evidence of reduced quality and quantity of water due to juniper	15	This is covered in the EIS.	Hydrology sections 3.6.1 and 3.6.2
047	Juniper and Hydrology	Treatment will affect streamflow and potentially stress watersheds already affected by climate change	17, 30, 47	This is discussed in the EIS.	Section 3.6.2
048	Juniper and Hydrology	Effects on water quality	11, 17, 30, 47	This is covered in the EIS.	Hydrology section 3.6.1 and 3.6.2
049	Monitoring	Recommend brief description of active raptor nest survey methodology	55	Raptor nest surveys will be conducted following standard protocols as described in Smith and Slater (2009), with a focus on areas where treatments may occur during the breeding season.	Section 2.2.5 Design Features--Wildlife; Appendix C - Monitoring Plan
050	Monitoring	Monitoring non-target species/ landscape response	11, 30, 33, 34, 36, 43, 55	Monitoring is essential for adaptive management as monitoring results identify if a change in management actions is warranted. BLM will monitor non-target species for their response to juniper treatments. BLM will focus on BLM sensitive species of migratory birds in sagebrush, juniper, and riparian habitats that may be affected by the project.	Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals; Appendix C - Monitoring Plan

051	Monitoring	Continue effectiveness monitoring of juniper treatment 10-15yrs from initial treatment in order to identify areas that require retreatment to benefit sage-grouse; develop quantitative trigger with more specific & substantive protocol	37, 44, 55	Monitoring details including duration and intervals are described in the final EIS.	Appendix C - Monitoring Plan
052	Monitoring	Increase amount of sites - minimum 1 site per treatment unit of 40,000-60,000 acres will miss retreatment areas; appropriately scale number of transects to size & heterogeneity of treatment areas	37, 55	Monitoring details including general number of plots per treatment type by acres are described in the final EIS.	Appendix C - Monitoring Plan
053	Monitoring	Conduct careful pre- and post-treatment monitoring that includes both sage-grouse utilization, noxious weed surveys, forb and grass production, elevation of the water table, soil productivity, use by migratory birds and raptors, livestock utilization, hiding cover for elk, treatment costs, and length between treatments.	11, 30	BLM will monitor the primary indicators for treatment objectives described in the final EIS Monitoring Plan.	Appendix C - Monitoring Plan
054	Monitoring	Include maps where monitoring sites will be and explain how treatment effects will be evaluated	17	Monitoring details are described in the final EIS.	Appendix C - Monitoring Plan

055	NEPA	EIS does not analyze alternative methods of habitat improvement.	36, 40, 43, 51	Juniper has been identified as one of the greatest threats to sage-grouse in southwest Idaho and this project focuses on the removal of that threat. True, there are other methods to remove juniper such as feller bunchers, mastication across the project area, and logging operations, but BLM has made an effort to take a light-handed approach to treatment by cutting with chainsaws and leaving juniper on site. This is also the most cost effective manner to treat the juniper. BLM considered an alternative to cut all juniper except old growth but it was not analyzed because there would have been a higher likelihood of negative impacts. Further, treating all late stage juniper would have required broadcast prescribed fire and would not have provided immediate benefits to sage-grouse or other wildlife as these areas would have required several years for sagebrush to reestablish. BLM is addressing other major threats to sage-grouse habitat such as wildfire by creating fuel breaks.	Section 1.0 Introduction
056	NEPA	Range of alternatives too narrow/purpose and need too narrow; DEIS does not address the underlying causes of the ecological change (juniper encroachment) it proposes to address/manipulate	17, 30, 36, 40, 43, 47	The purpose and need for this project is narrow. The focus of the project is simply to maintain and improve sage-grouse by removing encroaching juniper. BLM designed the alternatives to treat juniper with the least amount of impact using methods that have been used in several juniper projects across the west. The project was designed to be effective in treating juniper and provide immediate benefits to sage-grouse and other sagebrush obligate species. Several alternatives were considered but BLM did not analyze them because they did not meet the purpose or need and/or they did not provide immediate benefits to sage-grouse.	Section 1.1 Need for and Purpose of Action

057	NEPA	Not scientifically based	17, 30, 40, 43, 47	The proposed action is founded in the most recent science that indicates sage-grouse are negatively impacted by juniper encroachment at a population level (Baruch-Mordo 2013; Coates et al 2017; Prochazka et al. 2017, Svereson et al. 2017a), and that treatment of juniper has been shown to have population level benefits (Gibsone et al. 2016; Severson et al. 2017b).	Section 1.0 Introduction
058	NEPA	Inadequate baseline data and poor impact analysis of the various alternatives; must conduct baseline surveys of all sensitive species (plants, wildlife, aquatic species) and invasive/noxious weeds and analyze impacts to local and regional populations	17, 30	The BLM includes existing available data from multiple sources (e.g., IDFG, ISDA, NRCS, BLM, USGS, etc.) to conduct its analyses. It is also BLM's standard operating procedure to conduct project clearances (i.e., surveys specific to a proposed project) for sensitive and important resources during project planning and prior to implementation. Clearances not only serve to augment our existing/prior knowledge of these resources in the project area and to facilitate analyses, but also to mitigate potential impacts with the application of specific design features (e.g., avoidance buffers), or further, to eliminate impacts if a negative clearance results (i.e., a given area may be designated off limits to treatments). Further, implementation and effectiveness monitoring - including HAF and other vegetation attributes (COR indicators) and responses - will be conducted for life of the project.	Section 3.0 Affected Environment and Environmental Consequences; 2.2.7 Monitoring; Appendix C Monitoring Plan

059	NEPA	The NEPA implementing regulations refer to the selection and review of alternatives as “the heart” of the environmental review. 40 C.F.R. § 1502.14. Comparison of the alternatives helps to “sharply defin[e] the issues and provid[e] a clear basis for choice among options by the decision maker and the public.” Id. Although the BLM ostensibly considered 3 alternatives in the DEIS, all of the action alternatives employ the same treatment methods, varying only in scale and location. The BLM’s failure to consider any alternative methods in the DEIS amounts to a failure to consider alternatives.	43	It was the BLM's intention to propose a project that would be cost effective and provide maximum benefit to sage-grouse (and other sagebrush obligate species) immediately, if not shortly, following treatment by addressing one of its major threats (i.e., juniper encroachment). The BLM considered numerous other alternatives generated from scoping and comments received on the draft EIS; however, none of these met the purpose and need of the project. Therefore, the BLM maintains that the no action, action, and other alternatives (considered but not analyzed in detail) represent an appropriate range.	Section 1.1 Need and Purpose of Action; Section 2.7 Alternatives Considered but Not Analyzed in Detail
060	NEPA	EIS is not site-specific; recommends Supplemental EIS	15, 17, 40, 43	On-the-ground situations, such as vegetation types and land uses, are similar across the project area and the proposed treatment methods are designed to reduce the potential for impacts to resources. Further, treatment methods are straightforward and would be the same for each treatment unit. The appropriate clearances would be completed or supervised by subject matter experts prior to any work being implemented and the design features would be followed for each treatment area to ensure resource protection and plan compliance.	Section 2.2.3

061	NEPA	"BLM ignores sensitive species, forestry, vegetation, soils, recreation, wild lands and other protections of the Land Use plans in its claims of RMP compliance. Until BLM fully lays out the values of western juniper communities and the flora and fauna that inhabit them, and the wild lands, watersheds and recreational values that they provide, BLM cannot make a valid determination of RMP compliance."	30	The BLM maintains that this project is in conformance with the Bruneau MFP, Owyhee RMP, Idaho and Southwestern Montana Greater Sage-grouse ARMPA, and Owyhee Canyonlands Wilderness and Wild & Scenic River MP per the plans' numerous goals and objectives cited in the EIS. Further, many project design features have been developed and will be applied to protect the following resources: cultural and paleontological resources, wilderness, wildlife (including special status animals), hydrology and fisheries, vegetation, special status plants, and air quality.	Section 1.5 Conformance with Applicable Land Use Plans (pp. 9-10); Section 2.2.5 Design Features (pp. 21-23)
062	NEPA	Evaluate cultural values of public lands, recreational uses, and scenic uses and enjoyment	17	These issues are evaluated in the FEIS under the appropriate sections: Recreation and Visual Resource Management, Cultural and Paleontological Resources, Social Characteristics.	Section 3.10 Recreation and Visual Resource Management; Section 3.11 Cultural and Paleontological Resources; Section 3.14 Social Characteristics
063	Other	Previous comments were disregarded on all impacts of grazing to sagebrush ecosystem, ACEC designation, spread of noxious weeds, and jackpot burning.	17, 30	All comments have been considered and addressed in some manner. An analysis of effects to ACECs has been included in the EIS, and livestock grazing impacts have been analyzed in the cumulative impacts sections for all relevant resources. An ACEC designation alternative was considered but not analyzed in detail; see ACEC designation comment response above in Theme: Additional Alternatives - create ACEC. See also comment responses re: noxious and invasive weeds in the livestock context above in Theme: invasive/Noxious weeds. The threat of weed spread from project activities has been analyzed in numerous respective resources/sections (vegetation, soils, SSP, noxious weeds, etc.).	Section 2.7 - Alternatives Considered but Not Analyzed in Detail; Cumulative Effects Sections (3.2.3, 3.3.3, 34.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3, 3.10.3, 3.11.3, 3.12.3); Sec. 3.1 - Soils; Sec. 3.2 - Veg; Sec. 3.3 SSP; Sec. 3.4 Noxious Weeds

064	Other	Explain phased approach of implementation; provide criteria	11	Phased/incremental implementation is explained in the FEIS and criteria for application of this approach are provided.	Section 2.2.4 Methods; and Section 2.2.5 Design Features
065	Other	Describe to what extent past BLM activities and fires have altered sagebrush and juniper habitats	17, 43	Past, present and reasonably foreseeable future actions/events that shape/impact the project area are disclosed and analyzed in the EIS.	Section 3.0 Affected Environment and Environmental Consequences - Cumulative Impacts; Cumulative Impacts all resources (3.X.3)
066	Partnership	Strongly recommends Permittee involvement and coordination	38	Permittee involvement will occur as needed.	Not in EIS
067	Partnership	Requests BLM commit to meet with partners annually & incoporate a process for collaboration to prioritize treatment areas	44, 54	BLM has worked closely with collaborating agencies in the development of the project and all aspects of the project. BLM looks forward to continued collaboration through the life of this project and will plan on meeting with collaborators both in an office setting as well as in the field to plan and evaluate the work being completed.	
068	Riparian	Cutting will allow more and uncontrolled cattle grazing, which could result in degradation of riparian areas and/or increased grazing pressure on sagebrush habitats	17, 30, 32, 36	There would be no changes to livestock management, no increase of AUMs, and therefore; no increased pressure on sagebrush habitats. In fact, by improving rangeland conditions through juniper removal there would be less pressure on the existing healthy rangelands and riparian areas.	Section 2.7
069	Riparian	Cutting in riparian areas violates INFISH standards and protocols	30	The proposed project meets the guidelines and moves habitat towards meeting Riparian Management Objectives identified in INFISH.	Section 1.6
070	Riparian	Protection measures for riparian areas are inadequate; insufficient greenline buffer	11, 17, 30	BLM has numerous design features in place to limit potential impacts to riparian areas as described in the final EIS. Treatment of juniper in riparian areas complies with the Owyhee RMP and INFISH guidelines.	Sections 1.5, 3.6 and 3.7

071	Riparian	Sediment Issues and unstable banks	11, 30	Sedimentation/erosion and bank stability issues as a result of juniper treatments is discussed/analyzed in the final EIS. Numerous design features will be in place to minimize the potential for erosion and bank instability.	Section 2.2.5 Design Features; and Section 3.6.2 Hydrology--Environmental Consequences
072	Riparian	Stream temperature increase	11, 30	Phased implementation, dropping juniper on stream banks, willow plantings, and reestablishment of riparian hydric plant species will enhance stream shading and enable an increase in functional condition of streams leading to a more stabilized stream channel. These aspects will help regulate stream temperatures according to stream potential.	Section 2.2.5 Design Features (Pg. 21); and Section 3.7.2.2 for effects of juniper removal on functional condition of streams (Pg. 82).
073	Sensitive Plants	Flagging sensitive site may make it a "target"	36	Some areas with special status plant species present may require flagging. Treatments in the interior, more remote portions of the project area (which is the majority) would not be visible to the public so flagging, if necessary, would not create a target for public disturbance, vandalism, etc. Further, with today's current GPS technology (1-5 meter accuracy or better) and the requisite avoidance buffers (15-150 meters depending on treatment method), avoidance buffers mapped on GPS could eliminate the need for flagging in most cases, particularly in more visible treatment areas (i.e., alongside/adjacent to roadways). Further, it is unlikely that people will know the purpose for the flagging; therefore, the potential for vandalism is negligible.	Section 2.2.5 Design Features - subheading Special Status Plants (p 21)
074	Soci-Econ	Recommends including social-ecological impacts study and reference article to give public easier access to the results	38	The research paper that published this study was cited in the final EIS, and is now part of the project record	Section 3.15 - Social Characteristics

075	Soils	Need to address the importance of biological soil crusts and impacts (impacts from OHV, heavy equipment, etc.)	15, 17, 30, 32, 36, 43, 47, 48	Biological soil crusts have been added to the impacts analysis in the final EIS.	Section 3.1 Soils
076	Soils	Impacts to soils from heavy equipment, burning, OHV use	15, 17, 30, 32, 36, 43, 47, 48	Impacts to soils from all treatment methods and associated tools/procedures (heavy machinery associate with mastication, OHV use associated with cutting, and jackpot and pile burning) have been disclosed in the final EIS.	Section 3.1 Soils (3.1.2 Environmental Consequences)
077	Soils	Impacts to soils from Off-road vehicle (OHV) use	17, 30, 36, 47	OHV impacts to soils are disclosed in the final EIS.	Section 3.1 Soils (3.1.2 Environmental Consequences)
078	Soils	Juniper has few detrimental impacts to soils	15	Impacts to soils as a result of juniper encroachment are discussed in the final EIS.	Section 3.1 Soils (3.1.2 Environmental Consequences)
079	Vegetation	Inadequate mapping or identification of vegetation: BLM relied on old PNNL cheatgrass mapping from 2002, ignoring even the somewhat more recent Peterson 2006, 2007 information that found cheatgrass moving into hotter sites at higher elevations than previously thought. There is no valid baseline of cheatgrass presence, medsuhead presence, and risk of expansion provided.	17, 30, 47	The BLM includes existing available data from multiple sources (e.g., IDFG, ISDA, NRCS, BLM, USGS, etc.) including PNNL, fire history, ecological site descriptions (and state and transition models), noxious weed inventory and treatment data, and special status plant survey information and population condition rankings and information from IDFG/IFWIS), etc. to inform the affected environment and to conduct its analyses. Resistance/Resilience data (Chambers et al. 2014) also used to inform vegetation and site conditions.	Section 3.2 Vegetation; Section 3.3 Special Status Plants; and Section 3.4 Noxious Weeds

080	Vegetation	NRCS Ecosite descriptions BLM relies upon to portray vegetation conditions are flawed and inaccurate; historical vegetation conditions not accurately portrayed.	17, 30	The BLM includes existing available data from multiple sources (e.g., IDFG, ISDA, NRCS, BLM, USGS, etc.) including PNNL, fire history, ecological site descriptions (and state and transition models), noxious weed inventory and treatment data, and special status plant survey information and population condition rankings and information from IDFG/IFWIS), etc. to inform the affected environment and to conduct its analyses. Resistance/Resilience data (Chambers et al. 2014) also used to inform vegetation and site conditions.	Section 3.1 Soils; Section 3.2 Vegetation; and Section 3.12 Fire Behavior
081	Vegetation	The DEIS fails to provide a project-specific baseline of the extent of cheatgrass and medusahead in the project area.	43	The BLM includes existing available data from multiple sources (e.g., IDFG, ISDA, NRCS, BLM, USGS, etc.) including PNNL, fire history, ecological site descriptions (and state and transition models), noxious weed inventory and treatment data, and special status plant survey information and population condition rankings and information from IDFG/IFWIS), etc. to inform the affected environment and to conduct its analyses. Resistance/Resilience data (Chambers et al. 2014) also used to inform vegetation and site conditions.	Section 3.2 Vegetation
82	Wilderness	Proposed action is inconsistent with the Wilderness Act.	2, 15, 19, 20, 21, 22, 23, 24, 25, 30, 36, 40, 43, 51	Analysis within the DEIS, as well as the MRDG, discloses effects to wilderness and acknowledges specific impacts to wilderness characteristics such as the untrammeled, undeveloped, and natural characteristics as a result of the proposed project, both positive and negative. BLM is privy to the contents of the wilderness act, however, much like public scoping, analysis of all of the alternatives presented in the DEIS is a necessary part of the decision making process.	Section 3.9 Areas of Critical Environmental Concern; and Appendix D Response to Public Comments (from Draft EIS)

083	Wilderness	MRDG conclusion not substantiated	30, 40, 43, 56	The MRDG is a tool used in the decision making process, not the actual decision. The MRDG was an exercise to compare three different methods (alternatives) of juniper removal in wilderness for the Draft EIS Proposed Action (Alt B) as the one alternative proposing treatment in wilderness. Of the three alternatives specific to the MRDG, Alternative 1, selected strictly for this MRDG exercise, is the least impactful to wilderness character. However, it should be noted that all three alternatives in the MRDG had a negative grade in relationship to their benefits to wilderness. The negative grade indicates that the overall impact to the wilderness characteristics analyzed would be negative. Management has yet to make a decision on the DEIS and what alternative will be implemented, and will use this MRDG as one of many tools in that decision making process, specifically when looking at Alt B.	Appendix D Response to Public Comments (from Draft EIS); see also Section 2.2.5 Design Features -- Wilderness
084	Wilderness	Keep as "control" with no manipulation	11, 42	This is a viable option and would be accomplished through the selection and implementation of Alternative C or C1, both of which propose No Treatment within wilderness.	Section 2.4 Alternative B - Treatment Including Wilderness
085	Wilderness	Restrict travel and tools to non-motorized	11	Any work within wilderness associated with Alternative B would be conducted on foot and would utilize the minimum tool (handsaws only) as described in the final EIS.	Section 2.3 Comparison of Action Alternatives

086	Wilderness	BLM acknowledges that there are many potential causes of sagebrush-steppe habitat decline, but focuses its proposed action on only one of those potential causes (juniper encroachment). While some of the other potential causes are clearly brought about by human initiated activity (e.g. grazing activities and invasive grasses) and thus good candidates for wilderness-appropriate management restrictions, juniper dispersal may be the result of natural processes in action.	40	Regardless of the cause of juniper expansion, habitat degradation for many species of wildlife is occurring due to juniper encroachment and this includes the area within wilderness.	Section 1 Introduction
087	Wilderness	Burning in wilderness should only be completed at higher elevations.	11	There is no burning proposed in wilderness areas. Juniper would be cut with the use of handsaws only and then scattered.	Section 2.4 Alternative B - Treatment Including Wilderness
088	Wilderness	Burning in wilderness would leave thousands of pock marks across the landscape.	30	There is no burning proposed in wilderness areas.	Section 2.4 Alternative B - Treatment Including Wilderness
089	Wildlife	Juniper encroachment a minor issue for sage-grouse	15, 17, 30	Juniper encroachment has been shown to have measurable negative effects and cause population declines in sage-grouse (Baruch-Mordo et al. 2013; Coates et al. 2017; and Prochazka et al. 2017). Juniper treatments have been shown to improve habitat conditions for sage-grouse and increase populations (Severson et al. 2017; and Sanford et al. 2017).	Section 1.0 Introduction; Section 1.1 Need for and Purpose of Action; and Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Greater Sage-Grouse
090	Wildlife	Based on a map from the Sage-grouse Initiative, juniper encroachment is a minor issue for sage-grouse in the project area.	15	The map being referenced does not accurately portray the juniper situation on the ground. The map is a general view where we have used data that identifies individual tree canopies. We used the latest technology and data to identify our focal treatment area which has much more juniper in it than is illustrated in the Sage-grouse Initiative map.	Section 2.2.2 Focal Treatment Area Development

091	Wildlife	Since juniper invasion often occurs on slopes and not valley bottoms which sage-grouse use, juniper treatment may be of little benefit to sage-grouse.	30, 42	Juniper invasion is not just associated with slopes but also flatter areas and riparian areas (Miller and Taush 2001; Miller et al. 2005). Juniper treatments would improve riparian and vegetative health conditions throughout the area, restoring existing shrub steppe, aspen and riparian communities. Restoration of these habitats will aid in the conservation and perpetuation of the greater sage-grouse and other species closely associated with sagebrush habitats.	Section 1 Introduction; and Section 3.5 Wildlife/Special Status Animals
092	Wildlife	Sage-grouse monitoring needs to be completed	17, 30, 47, 55	Project implementation would take approximately 10 to 15 years, providing the opportunity for long-term monitoring and scientific studies. To document sage-grouse response to juniper treatments, the BLM plans to work with a university or other agencies in a long-term radio telemetry project. Monitoring of sage-grouse would focus on, but would not be limited to, the following: response to and use of treated areas, migration or other movement patterns, seasonal habitat availability and use, lek attendance, use of spring sites for brood rearing, changes in nesting areas, and survival.	Section 2.2.7 Monitoring--Effectiveness Monitoring--Sage-grouse; and Appendix C - Monitoring Plan

093	Wildlife	Need to determine root causes of sage-grouse decline.	19, 21, 24, 30, 43, 47, 51	Declines of greater sage-grouse are primarily due to habitat loss, fragmentation and degradation resulting from wildfire, invasive species, pinyon and juniper encroachment, conversion to cropland, and urban development (USDI Fish and Wildlife Service 2010a, USDA BLM and USDI FS 2015). Additional threats include mining, oil and gas development, infrastructures (including power lines and fences), improper grazing, human disturbance, nest predation, and disease such as West Nile virus. We focus only on juniper because it is one of the main threats to sage-grouse in the project area along with wildfire and subsequent invasion of annual grasses (ISAC 2006).	Section 1.0 Introduction; and Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Greater Sage-Grouse
094	Wildlife	"re-think how best to recover dwindling sage grouse populations based on solid peer reviewed science specific to the birds actual habitat needs"	48	The project is founded on the latest scientific research, which indicates that juniper negatively impacts sage-grouse populations (Baruch-Mordo et al. 2013; Coates et al. 2017; and Prochazka et al. 2017). Juniper treatments have been shown to improve habitat conditions for sage-grouse and increase populations (Severson et al. 2017; and Sanford et al. 2017). With that being the case, the proposed juniper treatments are the best way to improve habitat and benefit sage-grouse in the project area.	Section 1 Introduction
095	Wildlife	Expand project boundaries to incorporate documented sage grouse and broods, also travel corridors	53, 55	This comment has been addressed in the FEIS and project boundaries have been altered as suggested by cooperating agency biologists.	Section 1.4 Project Changes Made after Release of the Draft Environmental Impact Statement (DEIS)
096	Wildlife	Incorporate active Oregon leks near state border into project area	37, 55	The USFWS identified one lek just across the Idaho border they wanted to be included in the treatment area. This lek was added to the project area.	Section 1.4 Project Changes Made after Release of the Draft Environmental Impact Statement (DEIS)

097	Wildlife	Utilize GIS sagebrush canopy cover for potential treatment areas & priority category	53	The project area and potential treatment areas were reevaluated in the FEIS based on the updated GIS data for sagebrush and juniper canopy cover.	Section 1.4 Project Changes Made after Release of the Draft Environmental Impact Statement (DEIS)
098	Wildlife	Accurate occupied lek mapping vs historic leks	11	An accurate map of all the leks within the project area and their status is included in the FEIS.	Map 11 is located in Section 6.
099	Wildlife	Focus juniper treatment in PHMA	15	The focus of proposed Alternatives B, C and C1 is in PHMA, but this will not be exclusive in order to maintain connectivity within greater sage-grouse habitat. Fifty-four percent of the focal area is within PHMA. Furthermore, annual treatment units will be developed in collaboration with IDFG, NRCS, and FWS.	Section 2.2 Features Common to Action Alternatives--Annual Treatment Unit Development; and Section 2.4 Alternative B--Proposed Action
100	Wildlife	BLM planning to "grow" sage-grouse for "murderous hunters"	1	The purpose of this project is to restore, improve, and maintain Greater Sage-Grouse habitat at a landscape scale that is being and/or has been degraded by the encroachment of western juniper into sagebrush communities. This would also benefit other sagebrush-obligate species. The BLM does not manage hunting or "harvest" of sage-grouse. The Idaho Department of Fish and Game has statutory authority over the management of wildlife in Idaho, which includes monitoring population trends, developing hunting seasons and quotas, and overall management of wildlife.	Not within the scope of the project

101	Wildlife	BLM should "shut down the rabid murderous gun killers of sage grouse".	1	The purpose of this project is to restore, improve, and maintain Greater Sage-Grouse habitat at a landscape scale that is being and/or has been degraded by the encroachment of western juniper into sagebrush communities. This would also benefit other sagebrush-obligate species. The BLM does not manage hunting or "harvest" of sage-grouse. The Idaho Department of Fish and Game has statutory authority over the management of wildlife in Idaho, which includes monitoring population trends, developing hunting seasons and quotas, and overall management of wildlife.	Not within the scope of the project
102	Wildlife	Old growth juniper used by wildlife	15, 17, 30, 32, 47	Old growth juniper may provide important wildlife habitat including cavities and berries. Old growth juniper as characterized by Miller et al. (1999) is not targeted for treatment.	Section 2.2.4 Methods--Juniper Cutting; Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Cassin's Finch; and Section 3.5.2.3 Environmental Consequences--Wildlife Special Status Animals--Alternative B--Cassin's Finch
103	Wildlife	Bats, not analyzed	36	Effects to bats have been analyzed in the FEIS (Wildlife Section) and a design feature has been added to protect large bat maternity colonies from potential disturbance associated with treatment. Development of Annual Treatment Units in coordination with IDFG, NRCS, and USFWS would identify any new or additional concerns about bat resources.	Section 2.2.5 Design Features-Wildlife; Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Long-eared Myotis; and 3.5.2 Environmental Consequences--Wildlife/Special Status Animals--Long-eared Myotis

104	Wildlife	Big game cover	11, 17, 27, 30, 32	Due to the large size of the project area and smaller areas targeted for treatment, some juniper will remain across the landscape. Therefore, cover will be available to big game, particularly since areas with > 20% juniper cover are not part of the proposed alternatives B, C, or C1. In areas targeted for treatment, more open habitats would benefit pronghorn antelope and bighorn sheep and improve forage and cover for young for all ungulates.	Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Pronghorn Antelope; and Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals--Pronghorn Antelope
105	Wildlife	Juniper woodlands have few detrimental impacts on aquatic organisms or wildlife	15	Juniper can impact the aquatic environment in several ways. Because juniper can increase the levels of erosion and sediment transport into streams (Pierson et al. 2010; Pierson et al. 2013; Williams et al 2014), there are negative impacts to aquatic organisms. The deleterious effects of sedimentation on stream habitats have been well documented (Berkman and Rabeni 1987; Carling and McCahon 1987; Wood and Armitage 1997; Cederholm et al. 1980). Fine sediment smother fish eggs and reduce reproductive success. Excess levels of sediment also impact macroinvertebrates production which also impacts fish negatively. Juniper also leads to bank instability and channel degradation, impacting the hydrology and ability of a stream to provide quality habitat for aquatic organisms.	Section 3.6 Hydrology and Section 3.7 Fisheries

106	Wildlife	The project would result in habitat loss and fragmentation for wildlife, as well as increased disturbance	17, 30	The project would result in some habitat loss for species that utilize the sagebrush steppe-juniper woodlands ecotone, but much habitat will remain in sagebrush steppe and as juniper woodlands. As a result of the project, habitat fragmentation of both sagebrush steppe and juniper woodlands may actually decrease. Removing juniper would not result in additional anthropogenic disturbance.	Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals--Brewer's Sparrow and Cassin's Finch
107	Wildlife	Juniper provide habitat and food for some migratory birds	15, 17, 27, 30, 32, 43, 47	Disturbance to nesting migratory birds would be minimized with timing restrictions. There are no records of migratory bird species known to depend on junipers in the Owyhee Mountains, such as pinyon jay and juniper titmouse (USDI Geological Survey 2013). Several migratory birds which use the sagebrush-juniper ecotone may be affected by the proposed action, but many of these species have increased in Idaho and the Great Basin over the past decade (Sauer et al. 2017) and are not BLM special status species. Therefore, habitat loss for these species is not likely to result in population-level effects. In addition, BLM will monitor migratory birds pre- and post-treatment.	Section 2.2.5 Design Features-Wildlife; Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Brewer's Sparrow and Cassin's Finch; Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals--Brewer's Sparrow and Cassin's Finch; and Appendix C--Monitoring Plan
108	Wildlife	Concern regarding tree removal during nesting of migratory birds	30, 36	Potential impacts to nesting migratory birds will be minimized by restricting juniper treatment to outside of the peak breeding season, i.e., no treatment May 1-July 15 (or July 31 around occupied raptor nests). Where feasible, BLM would start annual treatments at lower elevations, where the majority of birds are done nesting by July 15.	Section 2.2.5 Design Features--Wildlife; and Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals

109	Wildlife	Recommend active/occupied raptor nest protection end date be extended to fledging and are no longer reliant on natal nest (may be as late as Aug 31 for some species)	55	In southwestern Idaho, the majority of raptor nests will have fledged by July 31. These nests will be protected from disturbance associated with the proposed action by either timing restrictions and/or disturbance buffers. Young that have fledged will be mobile and able to avoid disturbance.	Section 2.2.5 Design Features--Wildlife
110	Wildlife	Buffer areas should be established around all raptor nests with eggs or young/raptor nest protection	14, 28, 43	Species-dependent disturbance buffers for raptor nests (i.e., 0.25-1.0 mile; USDI BLM 2010) would be maintained through July 31, i.e., post-fledging for most raptors in the project area.	Section 2.2.5 Design Features--Wildlife
111	Wildlife	Terminology, active vs occupied raptor nests	14, 28	The terminology regarding raptor nests has been changed in the EIS.	Section 2.2.5 Design Features--Wildlife
112	Wildlife	Will raptor nest trees be removed after 7/31?	43, 44	The majority of raptor nest trees will not be removed since old growth juniper trees will not be cut.	Section 2.2.4 Methods--Juniper Cutting
113	Wildlife	Need restrictions for disturbances (e.g. juniper cutting, grazing) in sage-grouse late brood rearing habitats	17, 43	In the late brood rearing stage, sage-grouse are highly mobile and can easily move away from areas where juniper treatment is occurring. Therefore, no timing restriction is needed for the late brood rearing phase.	Section 3.5.2.2 Environmental Consequences--Wildlife/Special Status Animals, Alternative B--Proposed Action
114	Wildlife	Seasonal restrictions for wildlife can be altered on a whim	30	The only design feature for wildlife that could be "altered" as described in the DEIS was: *"No mechanized treatment of juniper from November through February in sage-grouse winter habitat. However, these dates may be altered by recommendation of a wildlife biologist.*" This was to address potential changes to sage-grouse winter habitat as a result of current telemetry studies. The text has been changed in the FEIS. BLM would obtain up-to-date information from IDFG on sage-grouse winter habitat in the project area prior to any winter treatment.	Section 2.2.5 Design Features--Wildlife; Section 3.5.2.3 Environmental Consequences--Wildlife/Special Status Animals--Alternative B--Greater Sage-grouse

115	Wildlife	Seasonal restrictions are too short for for migratory birds in juniper, sage-grouse, and big game; specifically, the avoidance period should start Jan 1	30, 43	Seasonal restrictions as described in the DEIS/FEIS are designed to protect wintering sage-grouse from November through February. Restrictions during those months will also afford some protection for wintering big game. For migratory birds, seasonal restrictions extend to July 15 and through July 30 in areas around occupied raptor nests. These restrictions coincide with the peak breeding season for migratory birds.	Section 2.2.5 Design Features--Wildlife; Section 3.5.2 Environmental Consequences--Wildlife/Special Status Animals
116	Wildlife	The DEIS fails to disclose key baseline information such as sage grouse lek attendance numbers and trends within the project area.	43	The FEIS includes information on the status and trends of sage-grouse leks in the project area.	Section 3.5.1 Affected Environment--Wildlife/Special Status Animals--Greater Sage-grouse; and Section 6 Maps 11 and 12
117	Wildlife	Removal of junipers may also facilitate raven predation on sage-grouse by opening line of sight from fence posts. Thus conifer treatments could paradoxically result in less nesting habitat being available for sage-grouse.	43	Junipers provide much more effective perch sites than fence posts because they are taller and provide a larger field of view. Removing juniper, even near a fence, would reduce effective avian perches and thus is likely to improve conditions for sage-grouse.	Section 3.5.3 Cumulative Impacts--Wildlife/Special Status Animals--Livestock Grazing
118	Wildlife	Removal of junipers may expose many miles of fence and increase risks of sage-grouse collisions.	43	We are treating areas with low levels of juniper where existing fences would already be visible to sage-grouse.	Section 1.0 Introduction

119	Wildlife	It fails to analyze the strong likelihood that BLM will need to do this project over and over again due to the fact that junipers will grow back—and what impacts repeated "treatments" will have on sage grouse.	43	BLM agrees that re-treatment would be necessary in approximately 5 to 10 years to clean up smaller trees that were missed during the initial treatment. After this second treatment, no treatment would be needed for approximately 25 to 30 years. Recent research has shown that juniper treatments benefit sage-grouse populations (Severson et al 2017b). The initial follow-up treatment would be very light and would not impact sage-grouse as it would simply be a cut and leave of small trees. Further, subsequent treatments would be much easier and less costly to accomplish because the juniper would not be as big and there would not be as many trees present.	

120	Vegetation	Seeding not feasible on a large scale, heavily grazed areas won't revegetate	36	BLM is not proposing large-scale seedings, or seedings in response to livestock grazing impacts. Changes to livestock grazing management to address any deficiencies in land health-and in response to grazing permit renewal applications-require a separate and specific process (i.e., permit renewal NEPA per Title 43 of the Code of Federal Regulations Subpart 4100 - Grazing Administration). This project is limited to juniper treatments only and any seeding would be to mitigate impacts specific to project implementation (e.g., pile burning). To that end, there are numerous design features in place to mitigate potential impacts to vegetation, including the potential spread of invasive or noxious weeds.The design features in question include: "Juniper treatment areas would be inventoried (and previous weed treatments monitored) for noxious weeds prior to implementation in areas of concern (per consultation with the District Weeds Specialist); Areas considered susceptible to noxious weed spread would be monitored and treated (chemically or otherwise) post-juniper treatment; Noxious weeds may be treated before or after juniper treatment depending on the target species and type of herbicide, or be avoided to the extent possible to reduce the risk of spread; Chemical treatment of noxious weeds would adhere to the Boise District Noxious Weed EA (EA#ID100-2005-EA-265) and the Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS (USDI BLM 2007); Juniper treatment equipment (masticators, trailers), including vehicles (trucks and ATVs/UTVs) would be	Section 2.2.5 Design Features--Vegetation and Noxious Weeds and Invasive Plants

				washed prior to use in the project area to reduce the potential for noxious weed or invasive species spread; and Native forb and grass seed (adapted to the site) may be hand broadcast at jackpot and/or pile burn sites or other areas deemed susceptible to weed spread due to treatment activities to facilitate establishment of desirable vegetation."	